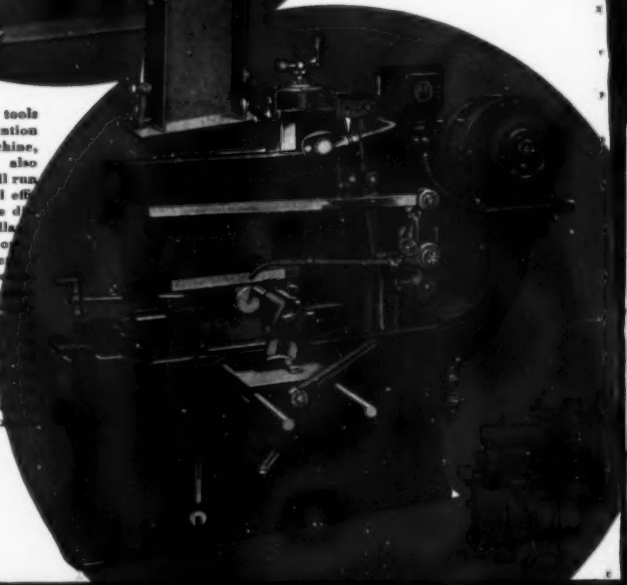
HITCHCOCK'S Machine Tool BLUE BOOK

FOUNDED **NOVEMBER 1939** 1905

MARVEL

...oo much for cutting-off

. unless you have one or new heavy-duty, super high MARVEL Automatic Hack you are paying too much utting-off. No other ma- of comparable accuracy t off an equal number of from bar stock in diame- 10" with such speed, at ow labor cost, power cost, ost or with such small chip Far heavier, and all ball- ng, these MARVEL auto- Saws No. 6A and 9A are for continuous operation at eds and feeds and blade ten- ns impractical for other equip- ent. They will cut off identical engths, 10 pieces of 6" round, 160 pieces pieces of 1½" round every hour floor-to-floor, and other sizes proportionally. They cut off squarely and accurately—*save stock and machining.*



While strictly production tools that require no more attention than an automatic screw machine, MARVEL Automatics are also multi-purpose; will handle all run of the shop sawing easily and eff ciently—bar push-up can be d engaged at any point, miscella ous cuts made, and automatic o ation resumed by re-engageme the bar feed drive. For misc neous sawing where the nu of identical pieces does not j an automatic bar push- MARVEL No. 6 or No. 9 wil the same low cost, high performance. Available with speed belt drive, 4-speed drive, single speed motor or motor drive with 4-speed t mission.

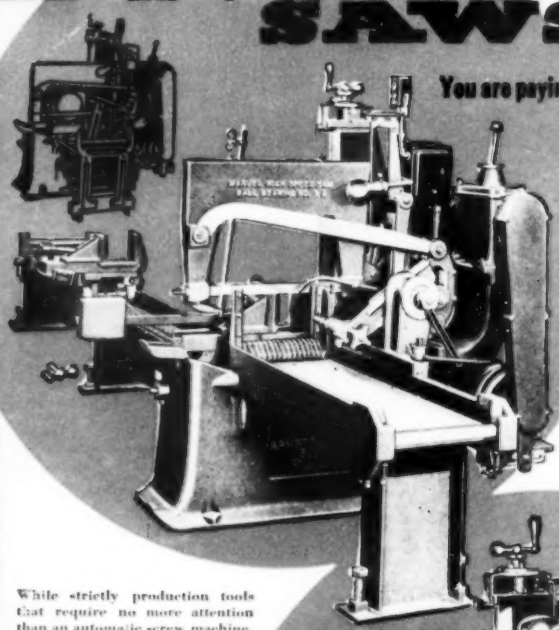
Send for catalog.

ARMSTRONG-BLUM M... ...ICAGO

5741 BLOO...

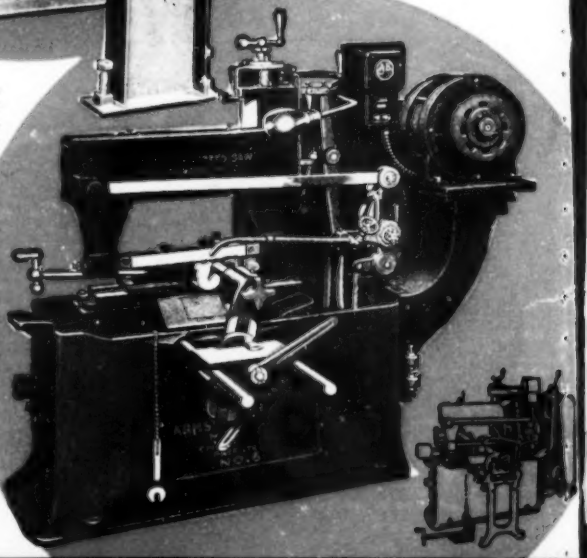
Profit by REMOTE CONTROL

MARVEL SAWS



You are paying too much for cutting-off

. . . . unless you have one or more new heavy-duty, super high-speed MARVEL Automatic Hack Saws, you are paying too much for cutting-off. No other machine of comparable accuracy will cut off an equal number of pieces from bar stock in diameters to 10" with such speed, at such low labor cost, power cost, tool cost or with such small chip loss. Far heavier, and all ball-bearing, these MARVEL automatic Saws No. 6A and 9A are built for continuous operation at speeds and feeds and blade tensions impractical for other equipment. They will cut off identical lengths, 10 pieces of 6" round, 160 pieces pieces of 1½" round every hour floor-to-floor, and other sizes proportionally. They cut off squarely and accurately—*save stock and machining.*



While strictly production tools that require no more attention than an automatic screw machine, MARVEL Automatics are also multi-purpose: will handle all run of the shop sawing easily and efficiently—bar push-up can be disengaged at any point, miscellaneous cuts made, and automatic operation resumed by re-engagement of the bar feed drive. For miscellaneous sawing where the number of identical pieces does not justify an automatic bar push-up, a MARVEL No. 6 or No. 9 will give the same low cost, high speed performance. Available with single speed belt drive, 4-speed belt drive, single speed motor drive, or motor drive with 4-speed transmission.

Send for catalog.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"* CHICAGO
5741 BLOOMINGDALE AVENUE

Profit by REMOTE CONTROL

THE BIGGEST IMPROVEMENT IN WELDING in years

Finger Tip Control at the Work Speeds Production . . . Improves Welds. Prove It With 30 Days Trial At Our Risk.

● With the Hobart Remote Control at his finger tips, the operator can control his work with 100 fine adjustments. Not only does this save time and money, but removes the temptation to "get by" with improper arc adjustments. Hobart's new "Multi-Range" Dual Control is another Hobart feature that makes better quality welding possible. These 2 exclusive Hobart advantages save time and cut costs.

Prove it **in your shop with**

30 DAYS TRIAL

Try a Hobart in your shop at our risk to prove it will soon pay for itself. No obligation.

HOBART BROS. CO., Box TB-119, Troy, Ohio

"One of the World's Largest Builders of Arc Welders."

FREE BOOKS

- ☐ New Hobart Catalog
- ☐ New Profits in Arc Welding

Hobart Bros. Co., Box TB-119, Troy, O

Send full information about the new Hobart cost-saving Arc Welder, particularly on the items checked below.

☐ Electric Drive ☐ Gas Drive ☐ Build Your Own

I'm interested in _____ Amp. capacity.

To be used for _____

Also information on ☐ 30 Days Trial ☐ Easy-to-Own Terms ☐ Renting with purchase privilege

NAME _____

ADDRESS _____ FIRM _____

CITY _____

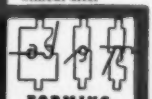
UP TO THE MINUTE...

Chicago Steel Brakes Are Modern in Design and Sturdy Construction

BOX AND PAN BRAKE—
Forms boxes or pans from one piece of metal. A straight brake as well as a box brake. Ideal for experimental shops.

HAND BRAKE—
Improved to meet modern needs. Efficient and dependable — sturdy and durable.

POWER BENDING BRAKE—
Indispensable wherever a volume of heavy plate work is done—forms a great variety of bends and shapes without dies.



FORMING PRESS DIES
We manufacture any type of die required for forming presses. Our die department will quote on any type to meet your needs. Submit blue print or sample of work.

36 Years' Experience..

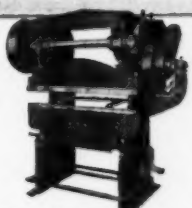
building STEEL CONSTRUCTED sheet metal working machines are behind each CHICAGO BRAKE. They're built to give years of service.

ALL CHICAGO BRAKES are built of rolled steel welded sections which insure great strength, accuracy and long life. They are the most modern tools in design and workmanship to fit today's need for fast production sheet metal working machinery.

We Are The World's Largest Manufacturers Of Hand Bending, Power Bending And Power Press Brakes.

Aside from the CHICAGO line, we have built many special machines for intricate bending operations. Take advantage of our many years' experience by sending us any difficult bending problem you have.

DREIS & KRUMP MFG. CO.
7440 LOOMIS BLVD., CHICAGO, ILL.



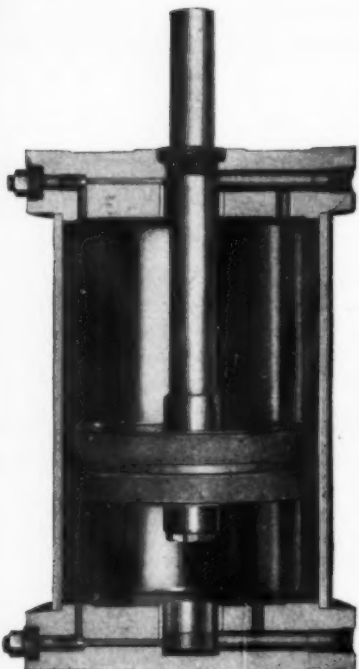
SMALL PRESS BRAKE—
Compact, powerful money-saving production unit. Replaces cumbersome costly machines that are expensive to operate. Uses same dies as larger machines.

LARGE PRESS BRAKE—
The only press brake which turns out perfect work without shims and crowned dies. Patented non-deflecting bed equalizes pressure over the full bending length and overcomes major fault in solid bed press brakes.

OVER 40,000 "CHICAGO" BRAKES in use by leading concerns—the world over

SJOGREN
PRONOUNCED (SHOW-GRIN)

Haraung



TOWARD YOUR BETTER PRODUCT

T-J

announces

HARD CHROMIUM PLATED *Cylinder walls and piston rods.*

During intervals of non-use and before installation, cylinders are ordinarily susceptible to rust. From the various methods of preventing this condition, Hard Chromium plating was selected because, in addition to its ably solving the rust problem, it becomes an important factor in increasing the efficiency of the cylinder. The same moisture (from the condensation of compressed air) or water (when the cylinder is used for water-hydraulics) which would ordinarily cause corrosion, now acts as a lubricant on these hard chromium plated bodies and piston rods actually increasing the "slickness" of the surface. This in combination with the polished, smoother surface obtained means less friction and prolonged packing life. Of no less importance is the fact that these cylinders with this new feature are now being furnished *at no extra cost.*

More "service" features are described in our catalog No. 36-A. It will assist you in selecting the type of cylinder that will help you *toward your better product.*

this is a **TOMKINS-JOHNSON** *product*

Factory at 605 N. Mechanic St., Jackson, Michigan

Agents in principal cities. T-J products also include Oil Hydraulic Cylinders . . . . Remote Control Systems . . . . Rotating Chucks and Cylinders . . . . Rivitors . . . . Clinchors . . . . Special Equipment . . . . Brownie Coolant Pumps . . . . T-J Die Sinking Milling Cutters.

CANEDY-OTTO No. 18 ROYAL

Floor and Bench Model Drills

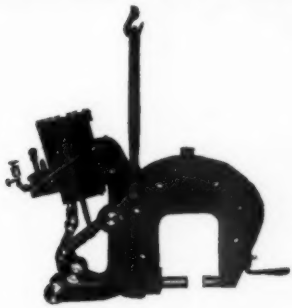
Featuring:

6 Speeds, 240 to 2185 with 1200 r. p. m. motor—345 to 3250 with 1800 r. p. m. motor.
18" swing 5¾" spindle travel.
Sand cast, machined V-belt pulleys.
Alloy steel 6-splined spindle, ground and polished.
High grade Lubri-seal ball bearings throughout.
Spindle cone pulley rotates between annular ball bearings.
Bench base working surface 16"x 16", over all 21½"x28".

These are sturdy, dependable drills, capable of accurate drilling on rigid day-after-day production schedules. Supporting columns are rugged. The Lubri-sealed bearings assure easy running and long life. Working surface is handy—and the three spoke feed is fast and easy to operate. Capacity up to ¾" with ½ h. p. motor, or up to one inch with ¾ h. p. 1200 r. p. m. motor.

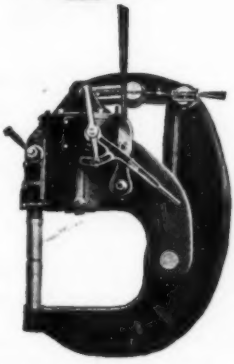
CANEDY-OTTO MANUFACTURING CO.
CHICAGO HEIGHTS, ILLINOIS

HANNA SQUEEZE RIVETERS



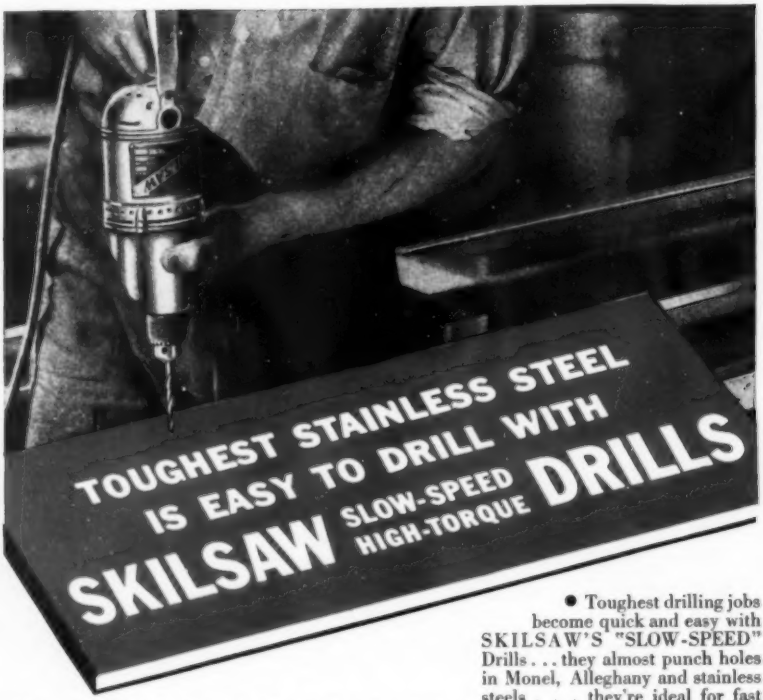
Small, light weight Squeezers or large, deep gap Stationary Machines. The line of Hanna Squeeze Riveters includes them all.

No previous riveting experience necessary as a Hanna Riveter sets each rivet with ONE stroke of the piston and with a predetermined pressure.



17—1" rivets per minute are easily set with the Shepard Pinch Bug Riveter illustrated. Rivets are inserted from above and headed from below. Compactness and light weight make it especially popular as a portable Squeezer.

HANNA ENGINEERING WORKS
1763 Elston Ave., Chicago, Ill.



● Toughest drilling jobs become quick and easy with SKILSAW'S "SLOW-SPEED" Drills . . . they almost punch holes in Monel, Alleghany and stainless steels . . . they're ideal for fast drilling in ALL sheet metals! Powerful motors maintain spindle speed whether loads are light or heavy—twist drills last longer because they're not sharpened as often. Try SKILSAW "SLOW-SPEED" Drills on your toughest jobs . . . and you'll never want any other kind.

SKILSAW, INC., 5035 Elston Avenue, CHICAGO

36 East 22nd St., New York; 182 Main St, Buffalo; 52 Brookline Ave., Boston; 15 So. 21st St., Philadelphia; 2124 Main St., Dallas; 918 Union St., New Orleans; 1253 So. Flower St., Los Angeles; 2065 Webster St, Oakland; 29 North Ave., N. W., Atlanta. Canadian Branch: 85 Deloraine Ave., Toronto

• SAVE DRILLING TIME!
• SAVE TWIST DRILLS!
• SAVE UPKEEP COSTS!

SKILSAW

SAVE MONEY IN EVERY INDUSTRY!

PORTABLE ELECTRIC TOOLS

• SAWS • DRILLS • BELT SANDERS • DISC SANDERS • GRINDERS • BLOWERS •

● *Sold by leading distributors of mine, mill, hardware and contractors' supplies.*

The New PROCUNIER UNIVERSAL Tapping Machines

If you're seeking maximum production tapping, with accuracy, flexibility, dependability and economy, you'll be interested in the new PROCUNIER Universal.

It offers remarkable speed and precision tapping on production jobs, plus three revolutionary features:

1—Four speeds ranging from 395 to 2050 r. p. m., handling a wide range of jobs efficiently for which conventional high speed tapping machines are inadequate.

2—One machine handles tap sizes from No. 2 to ½" through two interchangeable tapping heads.

3—Extra long spiral compensating springs conveniently located, with wide range hand screw adjustments, maintain pre-set tap feeding and reversing pressures independent of operator.

Whether for highly specialized production, or work involving wide variations, the PROCUNIER Universal offers outstanding advantages.

Write TODAY for Catalogs 37 & 38.

PROCUNIER SAFETY CHUCK CO.

14 SO. CLINTON ST., :-: CHICAGO, ILL.

Beatty TOGGLE DRIVEN BEAM PUNCHES

FOR PUNCHING EXTRA LARGE STRUCTURAL SHAPES AND MANUFACTURED PARTS

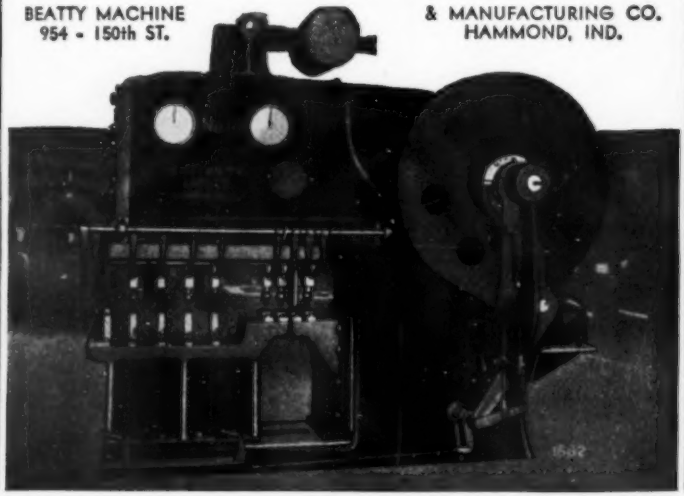
Giving you the many advantages of toggle drive—delivering maximum punching force at the point in the stroke where it is most required—imposing a more uniform torque on the motor—permitting a smaller flywheel—reducing power consumption, cutting maintenance costs and saving floor space—as contrasted with units with drives of the eccentric type.

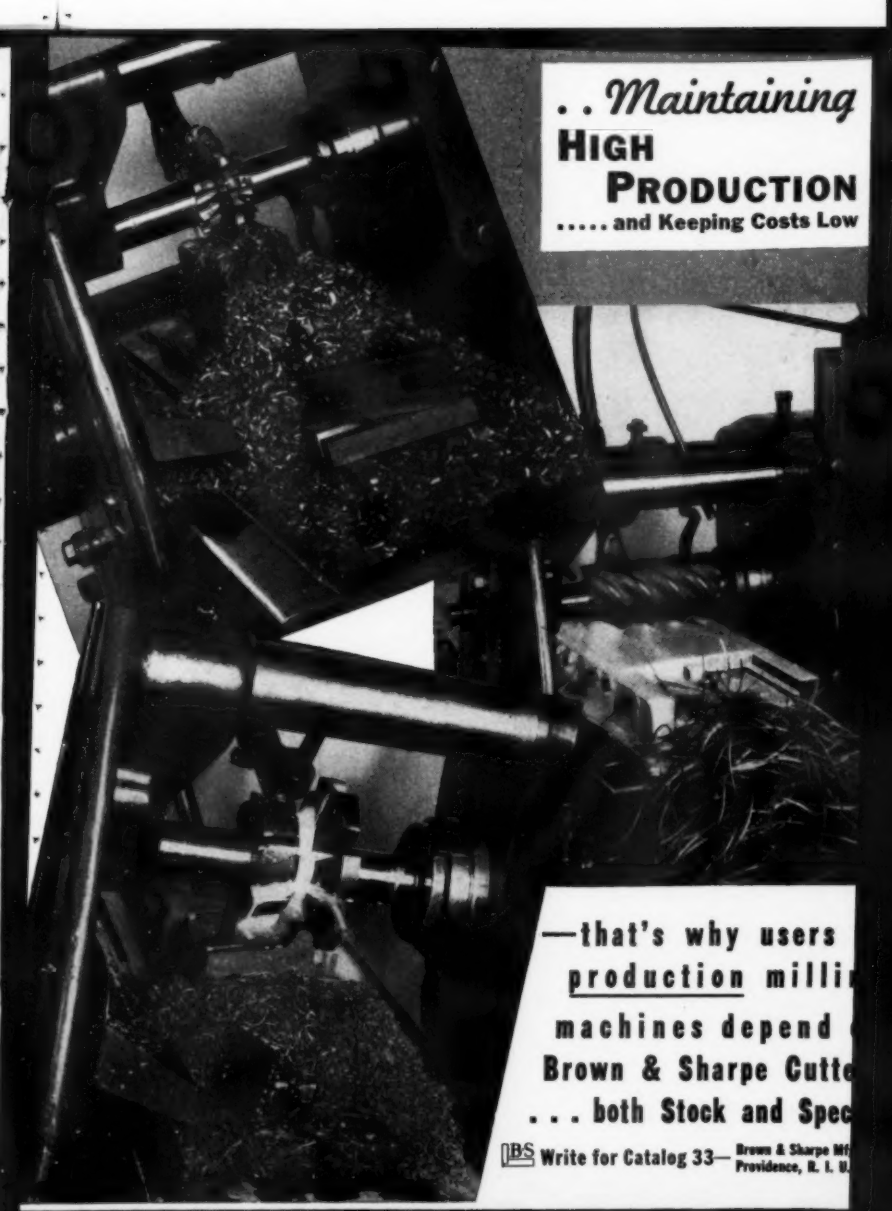
See how these BEATTY specifications compare with your requirements:

	No. 13	No. 14	No. 15
Face of slide, r to l, St'd	12¾"	12¾"	13"
" " " Maximum	24	24	34
" " " front to back	48	60	60
Die space	42	48½	48½
Stroke	2	2½	3
Throat	25	28½	34
Face of table, front to back	46	60	64
" " " r to l, St'd	22	22	28
" " " Maximum	30	34	38
Capacity	200T	300T	400T
Shipping weight, lbs.	42,000	57,000	76,000
Motor required, H.p.	7½	10	15
Spacing table to suit requirements			
Punching capacity	2 holes 1⅛" thru 1"	4 holes 1⅛" thru ⅞"	4 holes 1⅜" thru 1⅛"

Send for Folder 1500-A giving full information.

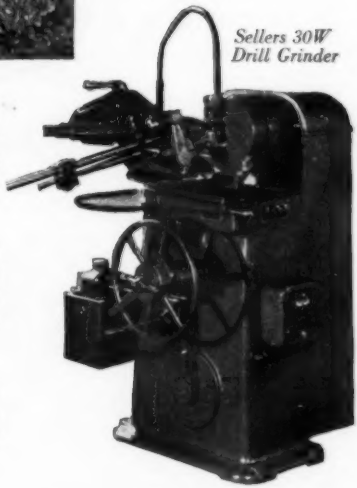
BEATTY MACHINE & MANUFACTURING CO.
954 - 150th ST. HAMMOND, IND.




. . Maintaining
HIGH
PRODUCTION
. . . . . and Keeping Costs Low
—that's why users
production milli
machines depend
Brown & Sharpe Cutte
. . . both Stock and Spec
BS Write for Catalog 33— Brown & Sharpe Mf
Providence, R. I. U.
BROWN & SHARPE

Correct angle of inclination is also important for *Drill Points*

Sellers 30W Drill Grinder



ACCURATE holes, drilling speed, drill life . . . all depend on the accuracy of the angle of inclination of drill lips. Angles too large or too small, unequal angles, result in slower drilling, oversized holes and premature breakdown of drill points.

Sellers method of grinding is inherently accurate. It automatically produces the correct drill point required for your work, with equal angles of inclination and identical lips . . . drill points that will last longer, drill faster and produce holes with absolute precision.

Eliminate the costly waste caused by incorrectly ground drill. Investigate Sellers Drill Grinders . . . they are used and recommended by all leading drill manufacturers.

WILLIAM SELLERS & CO., Incorporated
1616 Hamilton Street, Philadelphia, Pa.

FOUNDED SELLERS 1848

Sellers

APEX

FLOATING TOOL HOLDERS

Quick Change Collet Type

The use of Apex Floating Tool Holders is a sure method of producing uniform and accurately reamed holes. Apex Floating Tool Holders can be used on any machine in any position. Friction in the holder is practically eliminated by the patented ball drive.

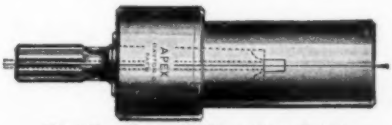
All parts are hardened and ground, and are interchangeable. The amount of float may range from a few thousandths to 1/8".

Shanks may be had in any taper or straight diameter, adapter shanks to General Motors or Chrysler Motor standards, key drive or special drive to suit machine spindle. Sockets may be had for Morse Taper or Straight shank tools.

Available with square drive collets, interchanging with those used on Apex Safety Friction Tapping Chucks, Positive Drive Chucks and Vertical Float Chucks, and with collets interchangeable with Quick Change Drill Chucks. Tap capacities to 2¼"; reamer capacities to 5".

Extended Socket Type

Write for Catalog No. 8.



Short Nose Type with Morse Taper Sockets

The APEX MACHINE & TOOL Co.
Dayton, Ohio

LONG STROKE—LOW PRICE

Order files are swelling and production is being forced more and more. All of this emphasizes the need of small presses to handle the small work—to prevent tying-up the larger presses with the smaller jobs.

Rousselle Presses are designed especially for trimming deep die castings and all other types of deep draw work within their capacity—jobs that otherwise require large, heavy presses because of the long stroke needed.

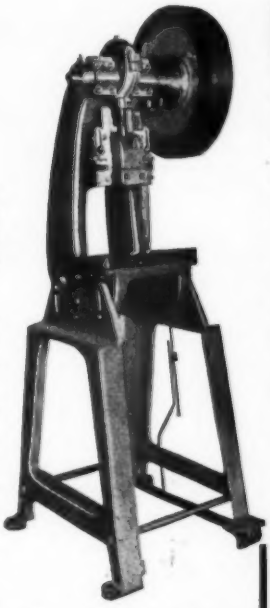
Rousselle Presses are speedy, versatile and dependable—economical in first cost and in operating cost.

With automatic feed, 10,000 operations per hour are possible. NON-REPEAT CLUTCH stops after each stroke, or can be set to operate continuously.

Remember Rousselles are the only inclinable punch presses obtainable at these low prices.

Check These Specifications:

Weight	450-lbs.
Crankshaft diameter at main bearings	4"
Diameter of crankshaft	1¼"
Flywheel weight	120-lbs.
Speed	300-r. p. m.
Diameter of flywheel	16½-inches
Ram standard stroke	2-inches
Adjustment of ram	2-inches
Size of bottom of ram	3x3"
Ram to bed; stroke down adjustment up	6½"
Size of hole in ram for punch	1¼"
Bed size	8x12"
Depth of throat to center of ram	4-inches
Size of opening between press frame at back	6-inches
Inclinable angle from right angle	30-degrees
Height	36-inches
Thickness of bolster plate	1-inch



Compare These Prices:

No. 0 Rousselle $100

No. 1 Rousselle $150

(less motor and Stand; Stand No. 0 $15.00 extra; and No. 1 $25.00)

Specially designed guard for motor drive-$10.00

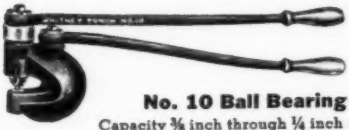
Send TODAY for Bulletin Giving Full Details.

DAVID J. ROSS & CO., BENTON HARBOR, MICHIGAN

WHITNEY

Whitney manufactures more than 80 types of Shears, Punches and other tool equipment for metal working—dependable items perfected through long experience and close contact with the trade—tools that have "always made good."

TOOLS



No. 10 Ball Bearing Punch

Capacity ⅜ inch through ¼ inch iron. Depth of throat 1⅝ inch. Height of throat ⅞ inch. Furnished with one punch in any size from ⅛ to ½ by 1/32.

Angle Mitre Notcher and Angle Iron Bender

Capacity 2"x2"x¼" angle iron or smaller. A pair of tools that every shop ought to have. They are Nos. 50 and 51 in our catalog.

No. 4 Angle Iron Shear

Capacity 2" x 2" x ¼" angle iron or smaller.

No. 20 Ball Bearing Punch

Capacity ½" thru ½" iron.

Imperial Roller Bearing Punches

—offered in 3 sizes—will work inside 90 degrees. Quick changing for punches and dies —no cams to wear—stripping action is positive.

Aircraft Rivet Squeezer

Capacity ⅛ inch aluminum rivet. Spindle travel 13/16 inch. Made in 5 sizes, with throat depths from 1¼ to 6 inches.

Send for the complete Whitney Catalog.

WHITNEY METAL TOOL COMPANY
115 FORBES ST., ROCKFORD, ILLINOIS

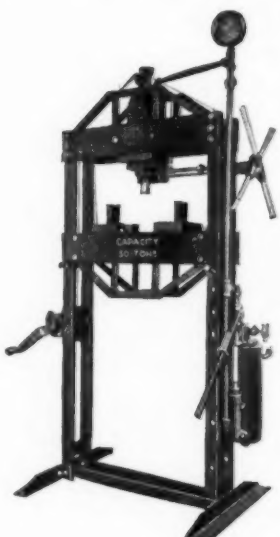
KRW HYDRAULIC ARBOR PRESSES

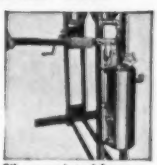
HAVE SPEED AND POWER FOR INDUSTRIAL USE

Rack teeth cut directly into ram—no separate rack bar.

Heavily constructed enclosed drum and ratchet raises and lowers bed.

Extensible cross-arms for greater leverage have locating grooves for extended and central positions.





Oil reservoir tank has convenient filling plug and shut-off valves.

V blocks furnished have machined shoulders for accurate alignment on bed.

Machined shoulders align V blocks when in inverted position and prevent slippage.

Built with the speed and strength necessary for industrial use, KRW Presses perform such operations as broaching, assembling, straightening, bending, offsetting, squeezing, pressing, and flattening. Small blanking operations can be performed when the blanking dies are built into a die set provided with guide pins.

Strictly a one-man press, special KRW features minimize operator fatigue. Trussed design of bed and crown members results in extreme rigidity and accuracy.

Write for new bulletin describing this cost-cutting equipment.

PRICES F. O. B. FACTORY, ARCADE, N. Y.

No. 37—35 ton Hydraulic and Sensitive Arbor Press	$150.00
No. 37E—50 ton Hydraulic and Sensitive Arbor Press	180.00
No. 37F—75 ton Hydraulic and Sensitive Arbor Press	300.00

Gauge and fittings, $20.00 extra on all presses.

K. R. WILSON

10-16 Lock Street, Buffalo, N. Y., U.S.A.

Export Department
90 West St., New York, N. Y.

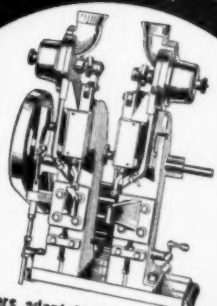
West Coast Branch
722 Mateo St., Los Angeles

AUTOMATIC RIVET SETTER

WITH *Adjustable* CENTERS

Sets 1 or 2 rivets at a time

For radios, switches, toys, electric parts and appliances, auto parts and accessories, and other small assemblies.



Centers adaptable to 6". For setting rivets up to ¼" body diameter. Bench and pedestal types.

Will give you volume production savings even on short assembly runs. Less capital investment.

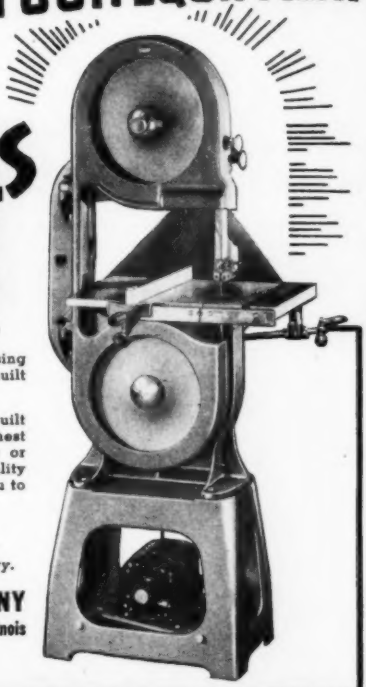
No obligation for assembly analysis. Send sample or blueprint with inquiry.

CHICAGO RIVET & MACHINE COMPANY

TUBULAR AND SPLIT RIVETS IN ALL RIVET METALS

1855 SO. 54th AVE. (Cicero P. O.) CHICAGO, ILLINOIS

MODERNIZE YOUR EQUIPMENT USE DURO TOOLS FOR INCREASED PRODUCTION



Industrial shops everywhere are increasing their production by installing Duro precision built tools.

The 16-inch Band Saw illustrated is not built to meet price competition but is built to the highest possible standards for the Production Shop or anyone who wants the finest in performance, quality and value that money can buy. It will pay you to get full details on this and other tools.

Made By
The Manufacturers of America's Finest and Most Complete Line of Power Driven Machinery.

DURO METAL PRODUCTS COMPANY
Dept. A-11 2651 N. Kildare Ave., Chicago, Illinois

Quality Utility • Economy

A complete range of sizes from ¼" Utility to ¾" Standard.

Duro's years of experience in building first quality electric drills assures the maximum in performance and dependability.

Duro Drills are powered by General Electric Universal Motors that will run continuously under maximum load without stalling. New Departure Ball Bearings, double reduction helical cut gears of chrome vanadium steel and Jacobs Keyed Chucks are only a few of their many superior features.

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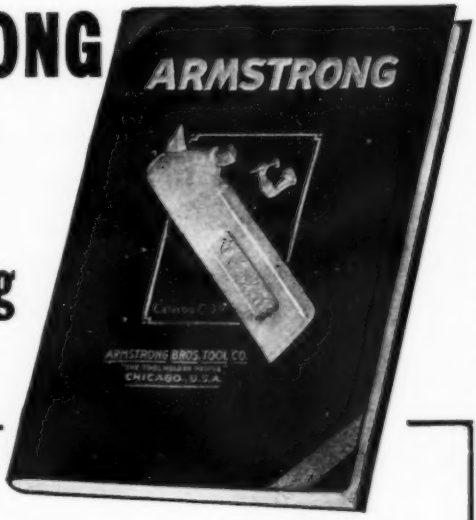

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The EDITOR'S PAGE

INK

Heavy manufacturing industries have budgeted hundreds of millions for capital improvements to keep abreast of the rise in business activities.

Directly and indirectly, a large share of this will benefit makers and users of machine tools.

A gratifying aspect is that most of these expenditures will be in preparation for the manufacture of domestic products used in normal peace time pursuits.

Machines that have been growing more and more obsolete will be replaced with speedier and more efficient production equipment. With the increase in manufacturing tempo, improvement is necessary in many cases for survival. New products will be developed. Existing lines will be refined, improved and reinforced with new sales appeal.

Payrolls will continue to swell and that means more and more of the modern comforts, aids and conveniences will become available for more people.

There is no quibbling though about the positive stand American people and American industry have taken on the subject of war. Neither wants any part of it.

Turning down transient profits, industry spurns traffic in the instruments of death and destruction. Aside from moral issues, the temporary financial gain does not justify dislocation of production and the peril of involvement.

Building arms and armament for self defense is something else again. That is an imperative call to which American industry will respond with every resource.

Business Indexes Soar . . .

The index of industrial production has passed the 1929 average. It is higher than for the so-called normal years of 1923-5—some 50 points above the depths of the 1938 "recession" and two points higher than the best showing in 1937, which was rated as a good year. Indications are that it may reach an all-time high sometime in December.

Ordinarily, factory production is a reliable gauge of business prospects. At present, the situation indicates an amazing upswing in steel. Tonnage of ingots during October should set a new high.

This steel is going into stocks rather than to war. The auto builders and railroads are buying because they anticipate price increases and delivery delays later as a result of war demands. The pace can hardly be maintained. Normal steel exports run about five percent of production and if doubled in the near future, this would account for only about 10 percent of our production capacity. which is hardly enough for a boom.

Movements are underway to ward off unjustified price increases resulting from the expansion. It is being recommended generally that profits should come from increased volume rather than price increases.

Already, manufacturers in the machine tool field have issued formal assurances against unjustified price increases. James F. Lincoln, President of Lincoln Electric Co., and A. Wyzenbeek of Wyzenbeek & Staff have pointed out the devastating effects of post-boom deflations.

Sampson a Piker . . .

An anonymous contributor asserts:

"Sampson was a piker. He killed a thousand men with the jaw bone of an ass.

"Every day ten thousand sales are killed with the same weapon."

Modern Grinding in the Modern Tool Room

In Two Parts—Part I

By Russel A. Reed,

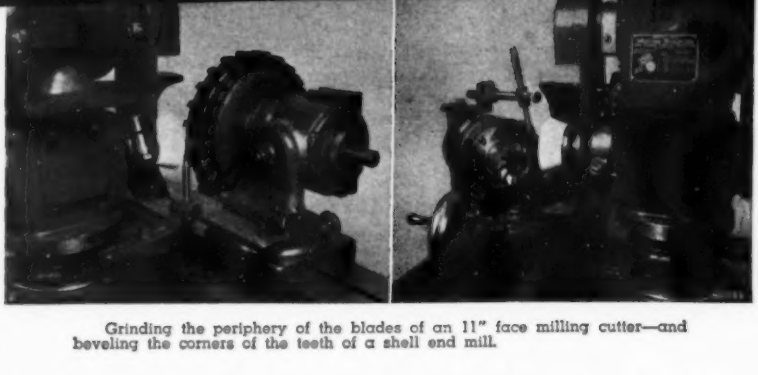
(Norton Company, Worcester, Mass.)

GRINDING in the modern tool room has become a highly technical operation. As the metallurgists have developed new metals for cutting tools, the grinding wheel manufacturers have developed new wheels to grind them. No longer will a few wheels in a few different grain sizes and grades of hardness suffice. The tool room worker of today may use as many as four abrasives, several bonds and a variety of sizes, shapes, grains and grades of wheels in each.

For example, he will use wheels of regular aluminum oxide abrasive for all jobs on steel where the pressures are fairly high, such as sharpening drills and the offhand grinding of lathe and planer tools. For milling cutters, reamers, chasers, hobs, broaches and the like, he'll use wheels of a special type of aluminum oxide abrasive. When grinding tools tipped with any of the cemented carbides he'll turn to wheels made of green silicon carbide abrasive or wheels made of genuine diamonds.

As the selection of the correct wheels for each job, and also their proper use are both vital to efficient and economical tool room grinding both aspects of the subject will be discussed in this ar-

(Left) Sharpening a large drill on a pedestal type drill grinder. (Right) Reclaiming a burned drill by cutting off the end with a resinoid bonded cut-off wheel and repointing.



Grinding the periphery of the blades of an 11" face milling cutter—and beveling the corners of the teeth of a shell end mill.

ticle. The physical characteristics of the wheels themselves will first be covered and then a brief description of their application on typical tool room jobs.

The Abrasives

The abrasives in grinding wheels may be classified into two general groups—the aluminum oxide and the silicon carbide abrasives. Both are products of the electric furnace, but differ materially from each other. Silicon carbide abrasive grains are intrinsically harder but are also more brittle. Aluminous abrasive grains, while not so hard, are tougher and do not fracture so easily and are thus able to withstand greater stress.

As a result of this difference in physical characteristics, aluminum oxide abrasive wheels are used for grinding steels of all kinds and other materials of relatively high tensile strength. Silicon carbide abrasive wheels are generally selected for grinding hard and brittle materials such as cast iron, the cemented carbides, and metals of low tensile strength such as brass, soft bronze and aluminum.

Most grinding wheel manufacturers produce two or three principal types of aluminum oxide abrasives possessing individual characteristics, principally with respect to "temper" or friability, which make each abrasive adaptable to different classes of work. For example, there is a special type of aluminum oxide abrasive that is more highly refined and of a slightly porous nature. It is thus more friable than regular aluminum oxide abrasive, which is tough and capable of heavy duty grinding. As a result, this special type has a cool cutting and almost self-dressing action. It is the most suitable type of abrasive for the majority of tool room operations on high speed steels and steel alloys. The principal exceptions are the off-hand grinding of lathe and planer tools and drill grinding where the greater pressures used call for the greater strength of regular aluminum oxide abrasive.

There are two types of silicon carbide abrasive in common use. In addition to the familiar gray—almost black-colored silicon carbide, there is a green-colored variety which is especially suitable for grinding cemented carbide tipped tools.

The Bonds

There are five different processes of bonding grinding wheels, namely, vitrified, silicate, resinoid, rubber and shellac. Each type of bond imparts distinct characteristics to the grinding action of the wheel. With this variety of bonds, therefore, it is possible to produce wheels that will meet most effectively the specific grinding requirements found in the modern tool room. The larger grinding wheel manufacturing companies can furnish wheels in all five bonds while some of the smaller companies specialize in one or more types.

Vitrified Bond

Most grinding wheels are made with a vitrified bond, which consists of a mixture of carefully selected clays. At the high temperature produced in the burning kilns, the clays mixed with the

abrasive grain, fuse into a molten glass condition. On cooling, a span of this glass attaches each abrasive grain to its neighbors and supports them while they grind. Most grinding wheel manufacturers have several varieties of vitrified bond with one or more of them especially suitable for tool grinding wheels.

Silicate Bond

Silicate (silicate of soda) bonded wheels have a milder cutting action than vitrified wheels and are especially suited for grinding fine-edge tools such as knives and cutlery and for any operation where there is a broad area of contact, or where the heat generated in grinding must be kept down to a minimum. In the tool room they are found on some of the large wet tool grinders.

Resinoid Bond

Resinoid bonded wheels are designed to operate at 9000 to 9500 surface feet per minute. Because of their fast cutting ability at these higher speeds, they are particularly suited for snagging castings and for other heavy duty operations. Resinoid bonded cut-off wheels are popular for cutting all kinds of materials. On proper equipment, such wheels can be safely operated at speeds as high as 16,000 s. f. p. m.

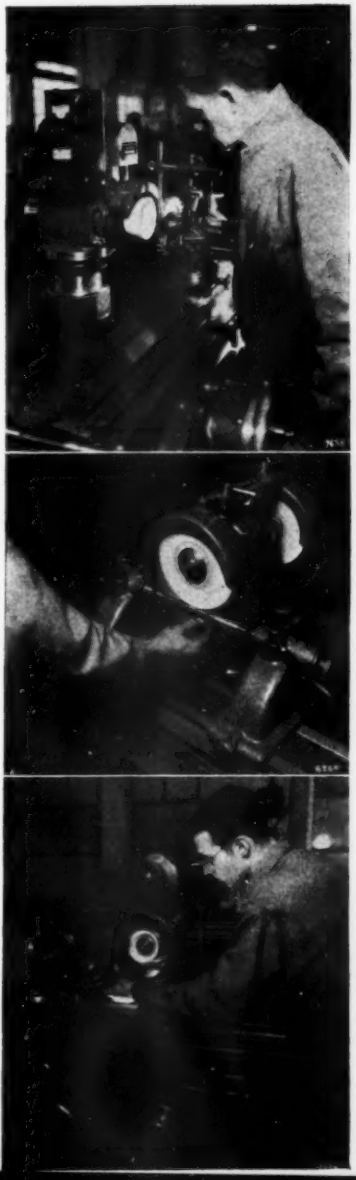
More recently, resinoid bonded wheels have been applied successfully to the grinding of large milling cutters. For this work they are operated at normal machine speeds.

Rubber Bond

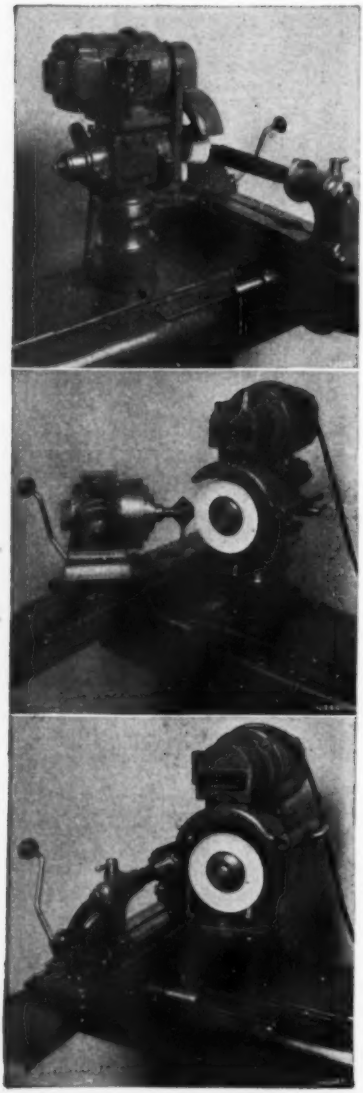
Rubber bonded wheels also are capable of rapid stock removal when operated at high speed. Their grinding action is characterized by a certain smoothness and as a result, they are used to a large extent on work where a high quality of finish is required, as on ball and roller bearing races. In the tool room, they are used principally for fluting taps and for wet cutting-off operations.

Shellac Bond

Shellac bonded wheels grind with a



(Top) Grinding the side of a side milling cutter. (Center) Regrinding the flutes of a tap. Note the tooth rest blade. (Bottom) Grinding the faces of the blades of a face milling cutter.



burnishing or buffing action as a result of the bond softening under the heat of grinding.

They are therefore capable of producing high finishes such as are required on camshafts and cold mill rolls. They are also widely used for grinding cutlery and for "gumming" saws in lumber mills.

Specifications

All grinding wheels are made up of three elements:—abrasive grain, bonding material, and pores. By the term "specifications" is meant the choice of these three elements which are described more fully in the following paragraphs.

A number is used to designate the size of individual abrasive grains in the wheel. This number corresponds to the meshes per linear inch in the screen employed in sizing the abrasive particles. For example, a grinding wheel of 36 grit contains abrasive grains that will just pass through a screen having 36 openings to the linear inch, but are retained on the next or 46 mesh screen.

Grain Sizes of Abrasives

Very Coarse	Coarse	Medium	Fine	Very Fine	Flour Sizes
8	12	30	70	150	280
10	14	36	80	180	320
	16	46	90	220	400
	20		100	240	500
	24		120		600

The finer flour sizes are classified by hydraulic separation. Combinations of various grain sizes are often used to produce a desired refinement in grinding action.

Grade (Hardness)

The abrasive grains in a grinding wheel are held in place by posts of bond. If these bond posts are very strong and are capable of retaining the grains against the grinding forces tending to pry them loose, the wheel is said to be of a hard grade. On the other hand, if only a small force is needed to release the grains, the wheel is said to be of a soft grade.

In the method of marking wheels most commonly used, the grade letters for all types of wheels range from E

(Top) Grinding a taper reamer. (Center) Sharpening a double angular cutter. Bottom) Sharpening a spiral milling cutter.

(very soft) to Z (very hard).

Very Soft	Soft	Medium	Hard	Very Hard
E,F,G	H,I,J,K	L,M,N,O	P,Q,R,S	T,U,W,Z

Inasmuch as this system is employed by practically all of the grinding wheel manufacturers it will be used for the specific wheel recommendations that follow in this article.

It should be understood that grade is not an exact value. Actually, it is a range between narrow limits, and all wheels that come within the range designated by any particular letter are considered to be of one grade and carry the same grade letter.

Factors Affecting Selection

The following is an outline of the factors which govern the selection of the various elements of a grinding wheel, viz., the abrasive, grain size, grade, structure and type of bond. It should be understood, however, that the rules and conditions set down are quite flexible and that occasionally exceptions will occur.

1. Factors Affecting the Selection of Abrasive

A. Physical properties of material to be ground	(Use aluminous abrasive (wheels for (materials of (high tensile (strength	(Carbon steels (High speed (steels (Alloy steels (Stellite (Malleable (iron (Hard bronzes, (etc.
	(Use silicon (carbide abrasive wheels (for materials (low tensile (strength	(Gray iron (Chilled iron (Brass and (soft bronze (Aluminum (Cemented (Carbides

2. Factors Affecting the Selection of Grain Size

A. Physical properties of material to be ground	(The softer and more (ductile the material, (the coarser the grain (size.
B. Amount of stock to be removed	(The larger the amount (of stock removal, the (coarser the grain (size.*
C. Finish required	(The better the finish (required, the finer the (grain size.*

*Exception — Very hard materials where depth of grain penetration is necessarily small.

3. Factors Affecting the Selection of Grade

A. Physical properties of material to be ground	(The harder the material, the softer the (grade should be.
B. Area of contact between wheel and work	(The smaller the area (of contact, the harder (the grade should be.
C. Wheel speed and work speed	(The higher the work (speed with relation to (wheel speed, the softer the resulting grinding action and the harder the grade should be.
D. Condition of the grinding machine	(The presence of vibration and worn master parts usually calls for a harder grade of wheel than would be required on a machine in good condition.
E. Coolants	(With the proper coolant, a harder grade of (wheel can usually be (used.

4. Factors Affecting the Selection of Bond

The vitrified type of bond is most generally used. However, in some instances, operating and performance requirements make the selection of other types of bonds advantageous or essential.

A. Dimensions of wheels	(Thin cut-off wheels (and others subjected (to bending strains require resinoid, shellac, (or rubber bonds. Solid (wheels of very large (diameters require silicate bond.
B. Wheel speed	(Vitrified wheels are (usually best for speeds (up to 6500 s.f.p.m.; resinoid, shellac and rubber wheels for speeds (above 6500 s.f.p.m
C. Finish required	(Resinoid, shellac or (rubber bonds are generally best for high (finishes.

*Exception—In machine grinding, reasonably fine finishes are obtainable with medium or even relatively coarse grit wheels by dressing the wheel fine with a diamond and properly adjusting the wheel and work speeds.

Standard Types of Grinding Wheels

Shown in Fig. 1 are cross sections of six standard types of grinding wheels which are representative of the various shapes that are most commonly used for tool room grinding. The six types of wheels are numbered and each dimension designated by a letter in accordance with the standards of the Grinding Wheel Mfrs. Ass'n. The key to the dimension letters is shown on this page.

This classification of grinding wheels greatly simplifies the stocking of wheels wherever a quantity is kept on hand. It also enables the user to order a grinding wheel accurately by giving the type number and dimensions as designated by the cross section of that type.

Key to Letter Dimensions

A — Flat Spot of Beveled Wall.
D — Diameter (Over All).
E — Center or Back Thickness.
F — Depth of Recess. (See Type 5).
G — Depth of Recess.
H — Arbor Hole.
J — Diameter of Flat or Small Diameter.
K — Diameter of Flat Inside.
M — Large Diameter of Bevel.
P — Diameter of Recess.
R — Radius.
T — Thickness (Over All).
U — Width of Face.
V — Angle of Bevel.
W — Thickness of Wall.

Grinding Wheel Speeds

It is good practice to operate a grinding wheel as near to the speed recommended by the maker as possible. In general, for cylindrical grinding, wheels should be run from 5500 to 6500 surface feet per minute; for surface grinding from 4000 to 6000 s.f.p.m.; for cutter grinding from 4500 to 6000 s.p.f.m. and for wet tool grinding from 5000 to 6000 s.f.p.m.

The grain, grade and structure usually recommended for any certain operation are based on the assumption that approximately the recommended speed will be employed. If for some reason this is not possible, then the grade at least should be changed to con-

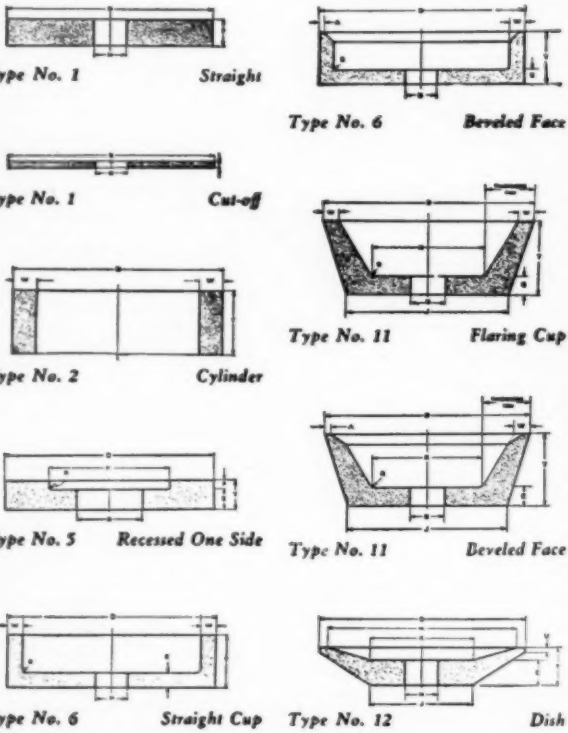


Fig. 1. — Standard shapes of wheels commonly used in tool grinding.

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form to the different speed.

Truing and Dressing the Grinding Wheel

These two terms are sometimes confused in the minds of grinding operators. Truing means removal of material from the cutting face of a wheel so that the resultant surface runs absolutely true. Dressing is the operation of cleaning or restoring the sharpness of the wheel face that has become dulled or loaded with the material being ground.

Truing can be accomplished best by the use of a diamond dressing tool rigidly supported in a fixed tool post. For certain classes of work, where an ordinary finish is acceptable, mechanical or abrasive wheel dressers have been found to be cheap and effective substitutes for the diamond. Obviously, the accuracy of such rotary truing devices is in direct proportion to the condition of their bearings.

Wheels used on tool and cutter grinding machines are preferably trued and dressed with a diamond. A hard diamond point in the dressing tool fractures the abrasive grains on the face of the wheel, or removes the dull grains entirely and thus allows new, sharp cutting points to be presented to the work.

For dressing large tool sharpening wheels, the Huntington type of dresser, rigidly supported on the work rest, is recommended. Small tool room wheels, including cutter grinding wheels. are commonly dressed and rough formed with a suitable silicon carbide abrasive stick applied by hand.

Sharpening Milling Cutters and Reamers

In general, it may be said that the working efficiency of a cutter is largely determined by the keenness of its cutting edges. Consequently, it is important to sharpen a cutter at the first signs of dullness. A dull cutter not only leaves a poorly finished surface, but the continued use of such a cutter leaves it in a condition where it becomes necessary to grind away a considerable portion of the teeth to restore the cutting edges. When the cutter is maintained in good working condition by frequent sharpening, it is certain to be cutting rapidly and effectively at all times. Furthermore, when such a cutter does need resharpening, it is necessary to grind the teeth only a very small amount to insure keen cutting edges.

Cutters and reamers are usually ground on tool and cutter grinding machines. The universal type of cutter grinder, as the name implies, can be set up for a variety of grinding operations, including light cylindrical, surfacing and internal, as well as for sharpening cutters of all kinds, reamers, etc.

The grinding machine for sharpening cutters should be kept in good repair. Wheel spindle must be free-running, but the bearings should be snug so that there is no tendency to chatter, nor must there be any end play. Table ways must be kept straight and true if accurate work is to be obtained. The tooth rest should be substantial enough to avoid springing and the tip shaped so as to provide a smooth and solid contact under the tooth that is being sharpened.

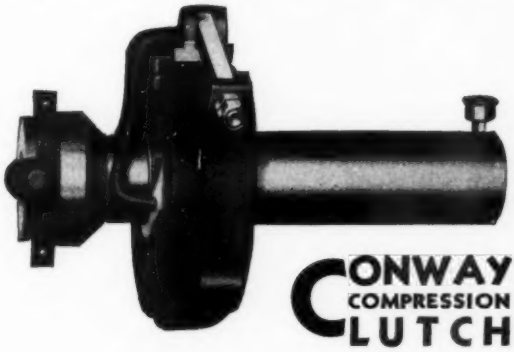
Grinding Wheels Recommended

For all grinding operations on high speed steel cutters, reamers and the like, the special type of aluminum oxide abrasive is recommended because of its cooler cutting action.

The grade of the grinding wheel used for sharpening cutters must be in the soft range to insure a free cutting action and to avoid drawing the temper of the cutting edge. At the same time, if the wheel is too soft, its rapid wear makes it difficult to keep the cutter a true cylinder or to produce a keen edge.

46-K, 46-J and 60-I special aluminum oxide abrasive, vitrified bond, in the order named, are the most popular specifications of small straight cup and tapered cup wheels for sharpening carbon steel, high speed steel and Stellite cutters of the profile types, which are ground on the back of the cutting edge. Included in this class of cutters are plain and side milling cutters, end mills, reamers, etc When the machine set-up calls for a straight wheel, 46-K or 46-L is most commonly used.

A Starting and Stopping Unit That Cannot Be Surpassed!



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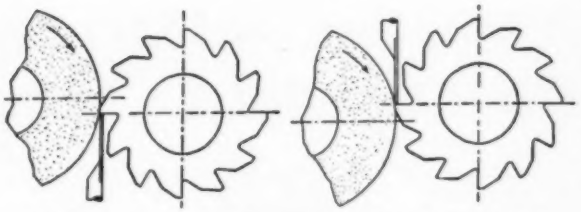


Fig. 2 and 3.—Method of grinding with wheel rotating off the cutting edge and Grinding with wheel rotating on to the cutting edge.

Formed cutters, including rotary gear cutters, are generally ground with dish shaped wheels, such as 46-J or 60-I special aluminum oxide abrasive, vitrified bonded. For sharpening Fellows gear shaper cutters, slightly finer grit wheels, such as 80-I should be used.

Dry grinding is recommended for all high speed steel cutter sharpening operations, as it has been found that water will cool the cutting edges too rapidly and cause cracking.

Direction of Wheel Rotation

Cutters and reamers may be ground with the grinding wheel rotation either toward or off the cutting edge as shown in the accompanying illustrations.

If the wheel is run off or away from the cutting edge as shown in Fig. 2, the wheel holds the cutter against the tooth rest. As this is the safer method, it is more commonly used. However, it has the objection of throwing up a burr on the cutting edge of the tooth which should be oilstoned off. Furthermore, there is some danger of burning the tooth at the cutting edge.

If the cutter is ground by rotating the wheel on to the cutting edge as shown in Fig. 3, there is less tendency to burn the tooth and a keener cutting edge, free from burr, is possible. However, care must be taken to hold the cutter firmly against the tooth rest as otherwise the rotation of the wheel will carry the tooth into the wheel and cause it to be ground away.

While straight wheels are considered in the foregoing, the same comments regarding direction of grinding wheel rotation apply to the use of cup wheels.

Clearance

Clearance or relief may be defined as the amount of stock removed from behind the cutting edge to permit the teeth to cut freely and to clear the material after the cutting edge has done its work.

It is important that the clearance be correct. If it is insufficient, the teeth will have a dragging cut, while if it is too great, the teeth will wear rapidly and the cutter is likely to chatter. Too much clearance, however, is less objectionable than too little.

The proper angle of clearance depends upon a number of factors, principally the type and diameter of the cutter and hardness of the material to be machined. For example, cutters employed on soft materials like brass can stand more clearance than those employed on steel or cast iron. Likewise, the clearance must be greater for small cutters than for large ones. For these reasons, it is generally agreed that the correct clearance angle for a given cutter must be determined by experience. Once the clearance angle (as well as cutting speed and feed) that gives the best results on a certain operation has been determined, it should be recorded for future reference.

As a general rule, the clearance angle should be from 6° to 7° for cutters up to 3" in diameter and from 4° to 5° for cutters larger than 3". The following table may also be used as a guide in selecting the proper clearance angle according to the material to be cut by the tool being ground:

Low Carbon Steels	5° to 7°
High Carbon and Alloy Steels	3° to 5°
Steel Castings	5° to 7°
Cast Iron	4° to 7°
Brass and Soft Bronze	10° to 12°
Medium and Hard Bronze	4° to 7°
Aluminum	10° to 12°

Typical Set-Ups for Sharpening Cutters

To give the reader a general idea of the methods commonly employed in the setting-up and sharpening of cutters, reamers and similar tools, a number of typical set-ups are shown, together with brief descriptions of the set-ups and the grinding procedures.

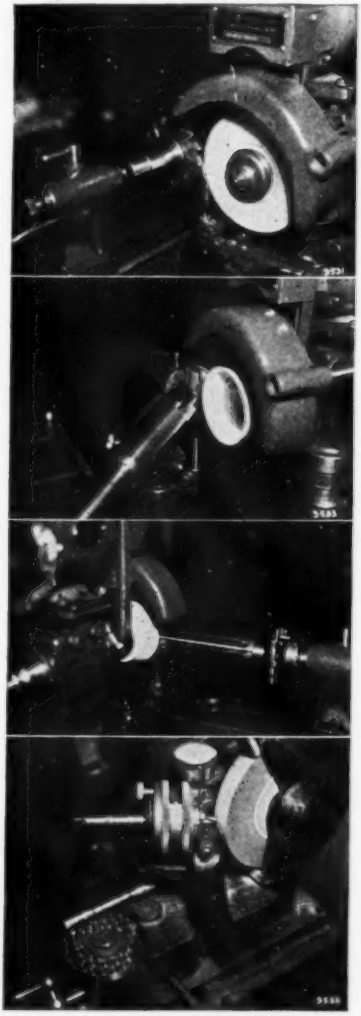
Plain (Spiral) Milling Cutters

The cutter is mounted on an arbor, supported between centers and set sufficiently below the center of the wheel spindle to provide the desired clearance. The tooth rest must be mounted on the wheel head and adjusted so that it has a complete bearing on the tooth to be ground, on the vertical center line of the wheel. This brings the cutter, wheel and work into contact at a common point. Holding the cutter against the tooth rest with a slight hand pressure to maintain a uniform spiral, the cutter is traversed across the wheel face, either by moving the table or sliding the cutter on a cutter bar.

In sharpening plain milling cutters the greatest difficulty lies in keeping the peripheral cutting edges radially equal (a cutter out of truth cuts with a constant pounding action). If wheel wear during the sharpening operation is equalized, it follows that the cutter is kept cylindrical. This is achieved by grinding around the entire cutter, then revolving it 180°, starting anew on a tooth just opposite the original starting point and taking another light cut all the way around the cutter. This method is repeated, taking light cuts until the cutter has been sharpened sufficiently.

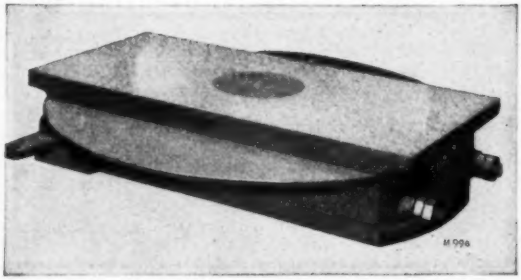
A cup wheel can also be used for grinding plain cutters. It possesses the advantage of producing a straight angle of clearance back of the cutting edge. To prevent the opposite side of the cup wheel from striking the cutter, the wheel head should be swiveled slightly from the zero line.

Some tool rooms have found that cutters for use on steel and cast iron will cut with less chatter and stand up longer between regrinds, if they



(The illustrations—top to bottom) Sharpening a staggered tooth milling cutter—Grirding the corners of the blades of a chucking reamer—Grinding an expansion type of hand reamer (note the adjustable center) and Sharpening a small drill on a bench type of drill grinder.

Sundstrand INDEX BASES



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are first ground cylindrically and then backed off to leave a land from .005" to .010" wide at the cutting edge.

Staggered Tooth Milling Cutters

Staggered tooth milling cutters, having alternately right and left-hand spiral teeth, may be sharpened at one setup by using a tooth rest with the top of the blade, either rounded or shaped with a double angle. The operation is similar to grinding a plain spiral mill, with the cutter mounted on an arbor between centers and the tooth rest fastened to the wheel head.

Side Milling Cutters

The cutter is mounted on a stub arbor and clamped in the Vee of the combination attachment or in the universal work head, which is swiveled to the required angle of clearance. The tooth rest is usually fastened to the work head.

Face Milling Cutters

While special machines of suitably heavy construction are available for sharpening large face milling cutters, if they are not too large they may be sharpened on a universal tool and cutter grinder. They should be mounted on a tapered shank supported in the work head spindle, in the same manner as they are supported on the milling machine. The operations involved in sharpening a face milling cutter are similar to those of sharpening a shell end mill and include grinding the periphery, face or sides and corners of the blades.

After grinding, the cutter should be carefully checked on the face with a dial indicator. If the cutter has been properly ground, taking light finishing cuts of not more than one-half-a-thousandth per pass assures uniform tooth height.

Angular Cutters

An angular cutter may be considered as made up of a number of plain milling cutters of different diameters. When grinding any cutter with a cup wheel, the clearance angle is determined from the diameter of the cutter. It follows that this method would lead to difficulties when applied to angular cutters because of the variation in the diameter of the cutter along the cutting edge. For this reason, a straight wheel is generally preferred for sharpening angular cutters.

End Mills

End mills with shanks are supported in the universal work head or in the combination attachment. If of the shell type they must first be mounted on a suitable arbor. In sharpening the end teeth, the work head is generally swiveled horizontally about one-half degree from the zero line so as to grind the teeth slightly low in the center of the mill and thus prevent dragging. The work head is swiveled vertically to obtain the desired clearance.

Formed Cutters

Formed cutters are ground radially on the cutting face with a dish wheel. Various methods are employed for controlling the spacing of the teeth. The method illustrated involves the use of a master form as a guide for the tooth rest. The master form is milled with the same number of teeth as the cutter and its accuracy, therefore, determines the accuracy of the cutter after grinding.

Where a master form or an index center is not available, the cutter is revolved until the face of a tooth just touches the cutting face of the grinding wheel. Previously, the wheel face and the center of the radial tooth cutter have been brought into the same vertical plane. The tooth rest is then adjusted against the back of the tooth to be ground.

Hobs

Like formed cutters, the teeth of hobs are made with uniform relief and are sharpened by grinding radially on the faces of the teeth, using the side of a dish wheel. The most important precaution to be observed in setting up for this operation is to line up the cutting face of the wheel with the center of the hob. Also, after each cut, the hob should be revolved toward the wheel for taking additional cuts and not adjusted to the wheel by means of the cross screw.

Chucking Reamers

There appears to be no standard method of sharpening reamers. In the case of machine or chucking reamers of the solid type, the size obviously is lost as soon as the periphery is touched

with a grinding wheel. Inasmuch as most of the cutting is done by the entering corners of the blades, it is common practice to sharpen such reamers by simply grinding the lead or front bevel, usually at an angle of 45°.

When the straight cutting edges become dull to the point of requiring sharpening, the reamer is ground cylindrically to the next smaller size. The cutting edges are then backed off, leaving a land from a few thousandths to about 1/32" wide, depending upon the material being reamed and the size of the reamer. The reamer will be found to cut better if it is left .001" to .002" smaller at the back end than at the front.

For reamers used on steel, best results are generally obtained with a land from .005" to .008" wide. For cast iron, a slightly wider land, about 1/64", may be used. For non-ferrous metals like brass and soft bronze, the land should be reduced to a "white line," no more than about .002" wide.

Hand Reamers

Except in the smaller sizes, the majority of hand reamers in use today are of the expansion or adjustable type. The usual procedure in sharpening such reamers is to set them up oversize a sufficient amount, grind cylindrically to the exact desired size and then back off the teeth so as to leave practically a sharp cutting edge, the land being no more than a few thousandths of an inch wide. A few light strokes along the cutting edges with an oilstone will remove any slight burr produced in grinding.

Taper Reamers

Taper reamers must be ground with great care in order to maintain the taper and the diameter absolutely correct. In the machine set-up illustrated, the tooth rest is fastened to the wheel head to insure parallel and straight teeth. The swivel table has been adjusted to the required taper per foot, as indicated on the graduated scale at the end of the table.

The proper cutting clearance will depend on the material to be cut and the size of the reamer.

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Sharpening Drills and Taps

Probably no tool is given as little thought in regard to its proper use and reconditioning as the common twist drill; yet no tool is more handicapped in its effectiveness by improper sharpening, or point grinding as it is sometimes called. Excessive drilling costs and imperfect holes can in most cases be traced directly to improper grinding of the point.

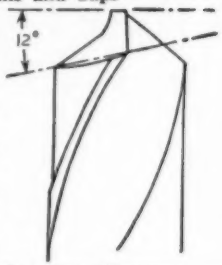

Fig. 4—Lip Clearance.

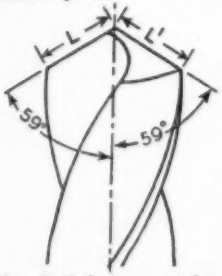

Fig. 5—Both lips must be at same lip angle and of equal length. (L — L').

Machine grinding is recommended as the more accurate method of sharpening drills. When properly machine ground, a drill will generally cut faster, last longer and produce more accurate holes than if ground by hand. Particularly, drills larger than 3/8" should be machine ground.

In the sharpening of drills, the following precautions should be observed:

1. The lip clearance or relief behind the cutting edges should be sufficient for the drill to cut freely, yet not enough to weaken the cutting edges.

If the lip clearance is insufficient, the drill will cut hard, heat excessively and may ultimately "split up the center." If the lip clearance is too great, the cutting edges will tend to chip and break down.

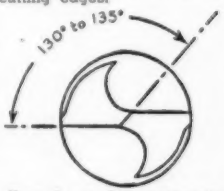

Fig. 6 — Lips properly ground but web requires thinning.

A lip clearance of 12° to 15° at the periphery of the drill (figure 4), increasing constantly toward the center, is considered standard for the average class of work. When this angle is correct, the chisel point or web intersection will be at an angle of 130° to 135° to the cutting edge (figure 6).

2. The two cutting lips must be inclined at the same angle with the axis of the drill (figure 5) and must be of equal length. If both lips are not ground at the same angle, the drill is subject to early failure as the lip having the larger angle is doing all the work; also the hole will be larger than the drill. If the lips are not exactly the same length, the point of the drill will, of necessity, be off-center and the drilled hole will be oversize.

For general purpose work an included angle of 118° (commercial standard) has been found most satisfactory. For soft cast iron, a somewhat more acute angle, about 90°, will give best results. For brass, the standard angle of 118° may be used but the face of the cutting lips should be ground slightly flat.

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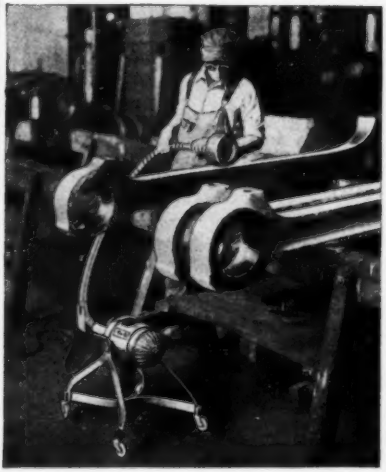

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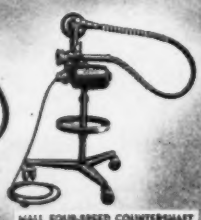

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3. After grinding the cutting edges, it may be necessary to thin the point or web (figure 7). If the width of the point is too great, excessive pressure will be required to start the drill and it will tend to rub rather than cut. On the other hand, if the point is too thin, there is a tendency for the web to split. Proper pointing diminishes the power required to feed the drill, enabling it to cut more freely.

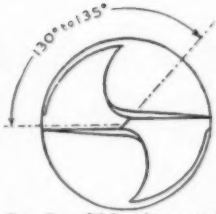


Fig. 7 — Web after point thinning.

Point thinning is especially necessary when the drill is worn down to a considerable extent inasmuch as the thickness of the web increases as the shank is approached. Care should be taken not to carry the ground portion too far up the flute, and to maintain the exact center of the drill as otherwise it will cut oversize.

Procedure in Sharpening a Drill

1. Grind the two cutting lips so that they have the same length, the same and correct angle with the axis of the drill and the correct clearance behind the cutting edges.
2. Thin the point of the drill, if necessary, by grinding a short groove on each side of the web. The pointing may be done offhand on a round faced wheel or on a special drill point thinning machine which accurately controls the thickness of the web and automatically centers the point to insure the drill cutting true. Broken or otherwise ruined drills can be reclaimed by cutting off the damaged section with a thin resinoid bonded cut-off wheel, and then grinding the cutting lips as in sharpening.

Grinding Wheels Recommended

Offhand Sharpening (Point Grinding):
Large drills .....36-P regular aluminum oxide abrasive, vitrified bond.
Small drills .....60-N regular aluminum oxide abrasive, vitrified bond

Machine Sharpening:
Large drills .....46-L regular aluminum oxide abrasive, vitrified bond
Small drills .....60-K regular aluminum oxide abrasive, vitrified bond

Point Thinning:
60-N regular aluminum oxide abrasive, vitrified bond

Cutting-Off:
60-P regular aluminum oxide abrasive, resinoid bond

Taps

A tap used after it becomes dull works under a great strain and is apt to chip or break, cut oversize, or produce rough and poor quality of thread. The remedy is to resharpen.

The chamfer becomes dull first, and as a rule it is necessary to grind only this portion of the tap. When grinding offhand, the operator should hold the tap lightly but firmly against the face of the wheel and keep turning it slightly so that a little more will be ground off the back of the teeth to produce the necessary eccentric clearance or relief.

The amount of relief will vary with the length of the chamfer. Five degrees is ample for ordinary plug taps. Bottoming taps, which have a very short chamfer and steep taper, should be ground with correspondingly more relief in order to cut freely. For tapping brass, the chamfer is often ground flat instead of with an eccentric curve, to insure sufficient relief.

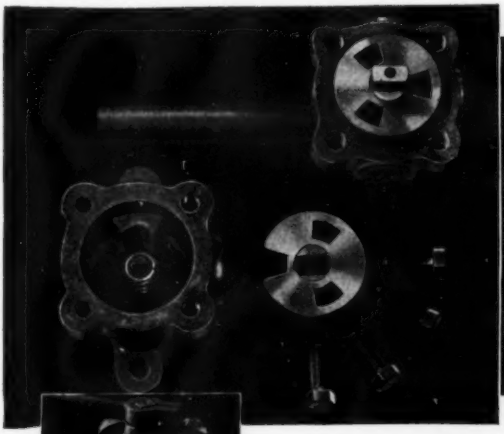
If the edges of the teeth become dull or nicked, it is necessary to grind in the flute. This may be done either offhand by passing it under a grinding wheel having the face rounded to conform to the radius of the flute, or it may be done on a tool and cutter machine, grinding back until the cutting faces of the teeth are sharp. In either case, the grinding pressure must be very light and the grinding wheel free and cool cutting to avoid drawing the temper and ruining the tap.

Considerable skill is required to sharpen a tap properly by offhand grinding and the results are usually uncertain. Special machines are available for sharpening taps accurately, insuring a uniform chamfer and the correct, uniform eccentric relief.

Grinding Wheels Recommended

Grinding Chamfer and top relief .....60-J regular aluminum oxide abrasive, vitrified bond
Fluting (small taps 60-R regular aluminum oxide abrasive, rubber bond
(large taps ..46-L special aluminum oxide abrasive, vitrified bond
Squaring ends .....60-M regular aluminum oxide abrasive, vitrified bond
Cutting-off .....60-P regular aluminum oxide abrasive, resinoid bond

(To be Continued)



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PER CENT OF THREAD CHART

(Reproduced by courtesy of R. G. Haskins Co., 623 S. California Ave., Chicago)

This chart has been prepared to give more detailed information on percentages of threads that can be obtained using certain sizes of tap drills. In most cases standard stock drill sizes are shown. Millimeter and decimal drills are shown only where a standard drill can not be furnished.

For each tap size, three (and in some cases four) tap drill sizes are shown so that the per cent of full thread obtainable by the use of any of these drills can be seen at a glance.

A 75 per cent depth of thread yields an ample margin of thread (2—1) and is economical in tapping.

A full depth of thread in a common nut is only about 5 per cent stronger than a 75 per cent depth of thread, yet it requires three times the power to tap.

Formula for obtaining tap drill sizes:—

$$\text{Outside diameter} - \frac{.974278}{\text{No. of thds. per inch}} = \text{Drill size for 75\% thread}$$

Percentage of thread for alternate drill sizes:—

$$\left(\text{Outside diameter} - \text{selected drill in decimal}\right) \div \frac{1.299}{\text{No. of thds. per inch}} = \%\ \text{thread}$$

Example: ¼"—20 thread

$$\frac{.974278}{20} = .0487139$$

.250" − .0487" = .2013" or No. 7 drill for 75% of thread

Size of Tap	Threads per Inch NC	NF	NS	Outside Diam. in Inches	Tap Drill Diam. Size	Inches	% of Full Thread
0		80		.060	1 25mm	.0492	66
					1 20mm	.0472	79
					3/64"	.0469	81
1			56	.073	53	.0595	58
					54	.055	77
					55	.052	90
1	64			.073	1/16"	.0625	51
					53	.0595	66
					54	.0550	88
1		72		.073	1/16"	.0625	58
					1 55mm	.0610	66
					53	.0595	75
2	56			.086	49	.0730	56
					50	.0700	69
					1 75mm	.0689	74
					51	.0670	82
2		64		.086	1 90mm	.0748	55
					49	.0730	64
					1 80mm	.0709	74
					50	.0700	79
3	48			.099	45	.0820	63
					46	.0810	66
					47	.0785	76
					48	.0760	85
3		56		.099	44	.0860	56
					2 15mm	.0846	62
					45	.0820	73
					46	.0810	77
4			32	.112	44	.086	64
					45	.082	74
					46	.081	76
4			36	.112	43	.0890	64
					44	.0860	72
					45	.0820	83
4	40			.112	42	.0935	57
					2 30mm	.0905	66
					43	.0890	71
					44	.0860	80
4		48		.112	41	.0960	59
					42	.0935	68
					2 30mm	.0905	79
					43	.0890	85
5			36	.125	39	.0995	71
					40	.098	75
					41	.096	80
5	40			.125	37	.1040	65
					38	.1015	72
					39	.0995	78
					40	.0980	83
5		44		.125	36	.1065	62
					37	.1040	71
					38	.1015	79
					39	.0995	86
6	32			.138	34	.1110	66
					35	.1100	69
					36	.1065	77
					37	.1040	83
6			36	.138	33	.113	69
					34	.111	75
					35	.110	78
6		40		.138	31	.1200	55
					32	.1160	68
					33	.1130	77
					34	.1110	83
8	32			.164	28	.1405	56
					29	.1360	69
					3 40mm	.1338	74
					3 30mm	.1299	84
8		36		.164	27	.1440	55
					28	.1405	65
					29	.1360	77
					3 40mm	.1338	83
8			40	.164	27	.144	62
					28	.1405	72
					29	.136	86
¼"	24	Stove Bolt		.195	4.2mm	.1654	67
					20	.161	77
					21	.159	81
10	24			.190	21	.1590	57
					22	.1570	61
					23	.1540	66
					24	.1520	70
					25	.1495	75
					26	.1470	79
					27	.1440	85
10			28	.190	22	.157	71
					23	.154	78
					24	.152	82
10			30	.190	21	.159	72
					22	.157	76
					23	.154	83
10		32		.190	19	.1660	59
					20	.1610	71
					21	.1590	76
					22	.1570	81
12	24			.216	14	.1820	63
					15	.1800	66
					16	.1770	72
					17	.1730	79

Size of Tap	Threads per Inch NC	NF	N8	Outside Diam. in Inches	Tap Drill Diam. Size	Inches	% of Full Thread
12		28		.216	12	.1890	58
					14	.1820	73
					15	.1800	77
					16	.1770	84
12			32	.216	11/64"	.1875	70
					13	.185	76
					14	.182	81
14		20		.242	8	.1960	68
					10	.1935	75
					11	.1910	79
14		24		.242	6	.204	70
					7	.201	78
					8	.199	79
1/4"	18	Stove Bolt		.250	3	.213	71
					4	.209	79
					5.25mm	.2067	83
1/4"	20			.250	5	.2055	67
					6	.2040	71
					7	.2010	75
					8	.1990	78
1/4"			24	.250	3	.2130	66
					4	.2090	76
					5	.2055	82
1/4"		28		.250	2	.2210	62
					1/8"	.2187	67
					5.5mm	.2165	72
					3	.2130	80
1/4"			32	.250	5.7mm	.2244	63
					2	.2210	71
					1/8"	.2187	77
					5.5mm	.2165	82
5/32"	18			.3125	11/64"	.2656	65
					G	.2610	71
					F	.2570	77
					6.4mm	.2520	84
5/32"			20	.3125	I	.272	62
					11/64"	.2656	72
					G	.261	79
5/32"		24		.3125	J	.2770	66
					I	.2720	75
					H	.2660	85
5/32"			27	.3125	9/64"	.2812	65
					J	.2770	74
					I	.2720	84
5/32"			32	.3125	7.3mm	.2874	62
					7.2mm	.2835	71
					9/64"	.2812	77
					J	.277	87
3/16"	16			.375	P	.2320	64
					O	.3160	72
					1/8"	.3120	77
					7.8mm	.3071	83
3/16"			20	.375	Q	.332	66
					11/64"	.3281	72
					P	.323	80
3/16"		24		.375	R	.3390	67
					8.5mm	.3346	74
					Q	.3320	79
					11/64"	.3281	86
3/16"			27	.375	11/64"	.3437	65
					R	.3390	75
					Q	.3320	89
7/32"	14			.4375	9/64"	.3780	67
					U	.3680	75
					23/64"	.3594	84
7/32"		20		.4375	X	.3970	62
					23/64"	.3906	72
					W	.3860	79
7/32"			24	.4375	Y	.4040	62
					X	.3970	74
					23/64"	.3906	88
7/32"			27	.4375	11/64"	.4062	66
					Y	.4040	70
					X	.3970	84
1/4"			12	.500	1/4"	.4375	58
					27/64"	.4219	72
					Z	.413	80

Size of Tap	Threads per Inch NC	NF	N8	Outside Diam. in Inches	Tap Drill Diam. Size	Inches	% of Full Thread
1/4"	13			.500	1/4"	.4375	62
					27/64"	.4219	78
					Z	.4130	87
1/4"		20		.500	11.75mm	.4628	57
					29/64"	.4531	72
					•	.4492	78
1/4"			24	.500	11.75mm	.4626	69
					•	.4595	73
					29/64"	.4531	87
1/4"			27	.500	11/64"	.4687	65
					•	.4640	75
					•	.4626	80
5/16"	12			.5625	1/4"	.5000	58
					31/64"	.4844	72
					31/64"	.4687	86
5/16"		18		.5625	33/64"	.5156	65
					13.0mm	.5118	70
					J"	.5000	86
5/16"			27	.5625	11/64"	.5312	65
					•	.5265	75
					•	.5230	82
3/8"	11			.625	14.0mm	.5512	63
					35/64"	.5469	66
					11/64"	.5312	79
3/8"			12	.625	9/16"	.5625	58
					35/64"	.5468	72
					11/64"	.5312	87
3/8"		18		.625	37/64"	.5781	65
					14.5mm	.5709	75
					9/16"	.5625	87
3/8"			27	.625	19/32"	.5937	65
					•	.5890	75
					•	.5860	83
7/16"	10			.750	17.0mm	.6693	62
					21/32"	.6562	72
					41/64"	.6406	84
7/16"			12	.750	11/16"	.6875	58
					43/64"	.6718	72
					21/32"	.6562	87
7/16"		16		.750	45/64"	.7031	58
					11/16"	.6875	77
					43/64"	.6719	98
7/16"			27	.750	21/32"	.7187	65
					•	.7140	75
					18.0mm	.7086	86
1/2"	9			.875	25/64"	.7812	65
					49/64"	.7656	76
					31/2"	.7500	87
1/2"			12	.875	11/16"	.8125	58
					51/64"	.7968	72
					25/32"	.7812	87
1/2"		14		.875	13/16"	.8125	67
					20.5mm	.8071	73
					51/64"	.7969	84
1/2"			16	.875	53/64"	.8281	65
					•	.8210	75
					13/16"	.8125	87
1/2"			27	.875	27/32"	.8437	65
					•	.8390	75
					•	.8340	85
					53/64"	.8281	98
1"	8			1.000	57/64"	.8906	67
					7/8"	.875	77
					55/64"	.8593	87
1"			12	1.000	15/16"	.9375	58
					59/64"	.9218	72
					29/32"	.9062	87
1"		14		1.000	15/16"	.9375	67
					•	.9304	75
					59/64"	.9218	84
1"			27	1.000	31/32"	.9687	65
					24.5mm	.9646	74
					61/64"	.9531	98

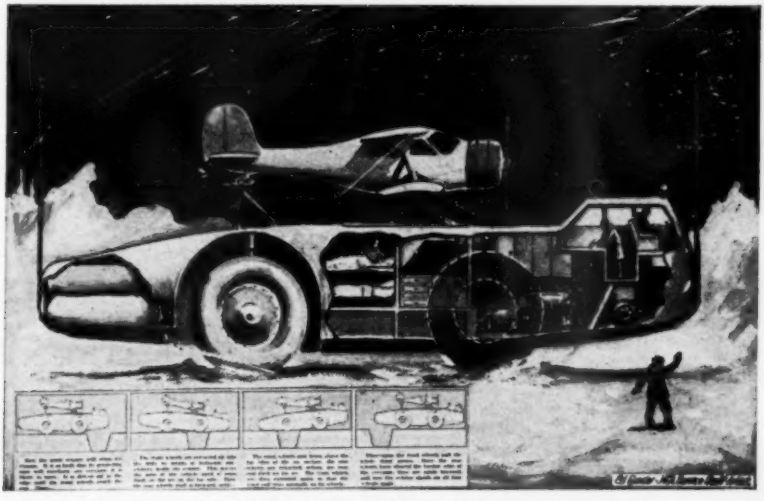
(*) Special drill required for this size as the next size larger drill gives too great a percentage of thread.

Building The Antarctic Snow Cruiser

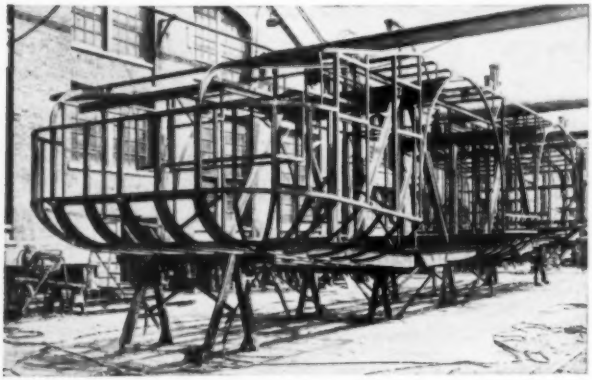
Lincoln Puts The Arc In The Antarctic

AN ANTARCTIC "Snow Cruiser," main cog in the government's South Polar claim-laying project is approaching completion at the plant of the Pullman Standard Car Mfg. Co., Chicago. Framework of the 4-wheel monster is fully completed and the application of the outer steel skin is proceeding rapidly.

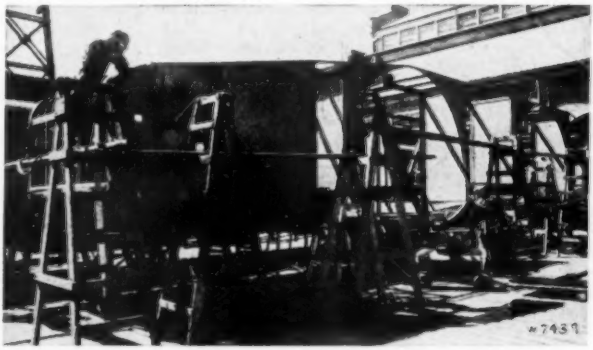
Design and construction of the 55-foot snow traveller was directed and carried out toward one highly desirable end — to obtain the strongest possible structure with least possible weight. Each two pounds of added weight means a sacrifice of one mile in cruising range. Greatest strength with least weight was obtained by use of high tensile steel structural members, fused into one single homogeneous structure by the modern shielded arc process of electric welding using the latest equipment manufactured for the purpose by The Lincoln Electric Co., Cleveland, Ohio. Lincoln "Shield-Arc 85" welding electrodes, developed particularly for welding high tensile steel, and Lincoln arc welding generators, were used ex-



Artist's conception of the Snow Cruiser, 55 ft. long, 15 ft. high, with a cruising range of 5000 miles and a top speed of 30 m.p.h., on 10 ft. diameter tires. The small photo inserts show the proposed method of crossing ice chasms through the use of retracting wheels and individual wheel drive.



The sturdy welded steel skeleton utilizes 16,000 lbs. of high tensile steel.

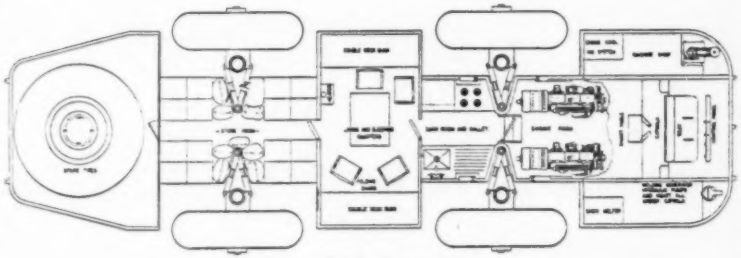


Modern arc welding assures maximum strength and minimum weight.

clusively. If conventional riveted construction had been employed, it is estimated that the weight would have been at least 30% greater. Thus, the 16,000-pounds of structural steel would have cut the cruising range materially from the estimated 5000 miles.

Construction of the "Snow Cruiser" by arc welding, consisted of fusing together a great number of structural members, cut, formed, fabricated and fitted to the design. Work began with the laying of the 5 longitudinal strength members which are standard 12-inch I-beams, slit lengthwise of the web, vee'd to a taper, then arc welded to provide one-piece members which may be seen in the photo. This is a unique construction made possible by welding. From this point, construction became a matter of assembling the structure a part at a time, first tack welding each additional part into the structure until alignment could be checked and then permanently fusing the parts into the whole with full-penetration finishing welds.

Three sizes of Lincoln "Shield-Arc 85" electrodes for high tensile steel were used for the welding. 1/8-inch size was

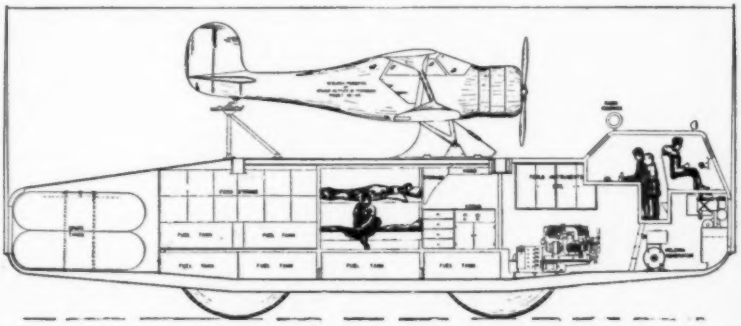


used for tack welding and light gauge work, 5/32-inch for the bottom shell and medium thicknesses, and 3/16-inch for the heavy welding. Approximately 550 pounds of electrode was required for construction.

Utilized so effectively in construction of the "Snow Cruiser," arc welding will also be an extremely important adjunct to the polar vehicle's permanent equipment, for a Lincoln arc welding generator, of 200-ampere capacity, fitted for belt drive, will be permanently installed, together with a kit of Lincoln arc welding electrodes. The welder will be a useful tool for the Cruiser's machine shop where it will be used for all sorts of necessary repairs such as the welding of broken or worn machine or structural parts, the fabrication of miscellaneous devices and equipment. With a carbon electrode the welder can be used to cut metal. Indispensable in many ways, the welder may be used for charging batteries and for supplying power to raise or lower the wheels. It may also prove a vital aid in case of emergency since it can supply current for lighting or for operating tools, even starting the Diesel engines with which the "Snow Cruiser" is to be equipped.

The "Snow Cruiser" was designed by the staff of the Research Foundation of Armour Institute of Technology, Chicago, as a fundamental research project under the direction of Dr. Thomas C. Poulter, scientific director, who was second in command and senior scientist of the Byrd Antarctic Expedition II.

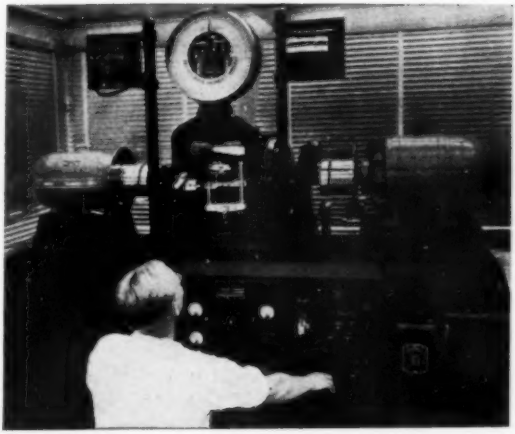
As unique a self-propelled vehicle as was ever produced by man, the "Snow Cruiser" will carry provisions for one year for a crew of 4 men, will carry a complete scientific laboratory and will make it possible by means of an airplane transported on its top deck,



to explore a strip of territory 600 miles wide. Capable of traversing 15-foot crevasses, propelled by any one or all four of individually driven wheels, the "Snow Cruiser" unit should be able to map out and explore in one month more territory than all previous expeditions combined.

Glass Fiber Insulation

A DEMONSTRATION of glass fiber insulation for motors is attracting attention at the New York Fair. Sponsored by Owens - Corning Fiberglas Corp., the exhibit is called, "The Electric Motor of Tomorrow."



A completely Fiberglas - insulated motor in a standard five h. p., frame size is shown, delivering, constantly, the same power as a standard cotton-wound 10 h. p., motor opposite.

The exhibit demonstrates that Fiberglas permits a substantial reduction in size and weight of motors. It also demonstrates that motors with such insulation may be operated at higher temperatures.

Further, it is evidence that the rating of many motors using Class A insulation could be increased from 50 to 100 per cent with the aid of glass insulation.

The two motors in the exhibit are hooked up to a dynamometer through a coupling and the load may be alternated readily between one and the other. The gauges show that the small motor, which is some 160 pounds lighter in weight and 45 per cent smaller in volume, will develop the same power as the larger standard motor and without sacrifice of stamina.

The smaller motor weighs 190 pounds as compared to a weight of 354 pounds for the larger motor. Both are 1750 r. p.m. squirrel cage induction units wound for 3-phase, 60-cycle, 220/440 volts current. The frame size of the Fiberglas motor is No. 254—standard for five h.p.—and frame size of the larger motor is No. 324—standard for 10 h. p.

There is a marked difference in the temperature rise. At full load this is 55° C. in the standard motor, whereas the smaller motor permits a temperature rise to 100° C. at full load.

Because the commonly used types of organic insulation—such as cotton, silk, and paper—rarely permit a rated temperature rise greater than 55° C., insulation of the standard motor probably would burn out soon if the motor were run at the higher temperature of the smaller motor.

Stator coils of the new motor are

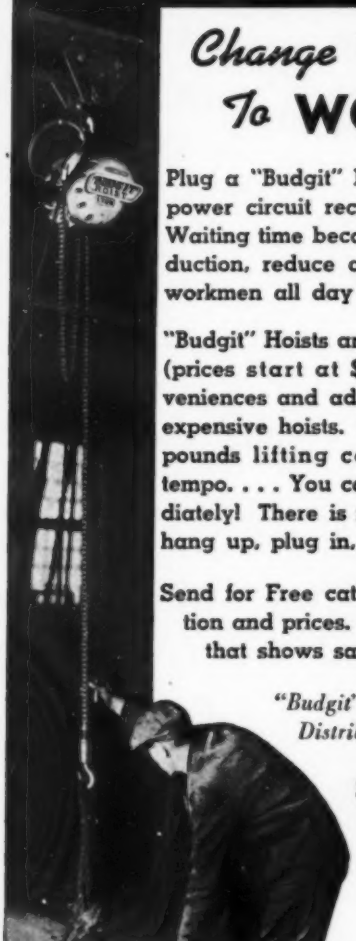
wound with glass-insulated magnet wire and taped with Fiberglas tape. Stator slots are lined with an insulation made of a combination of mica splittings and Fiberglas cloth bonded together. The slot wedges are made of a molded product consisting of laminated Fiberglas cloth and a bonding media. Lead wires are protected with Fiberglas braided sleevings and tied down with Fiberglas tying cord.

The new insulation has also helped to solve the problem of moisture absorption. In fact, it is asserted that glass is the first practical totally inorganic textile—with characteristics permitting it to be used on standard textile machinery. In the laboratory and in operation it is asserted that these characteristics have proved it to be, in most cases, superior in many ways to other fibrous materials used for electrical insulation.

Fiberglas insulation is being specified for a wide variety of jobs, ranging in size from fractional horsepower motors to the largest of generators—such as will be used in the Grand Coulee Dam.

HAMILTON, OHIO

NEW PORTABLE ELECTRIC "BUDGIT" HOISTS



Change WAITING TIME *To* WORKING TIME

Plug a "Budgit" Hoist into the nearest lamp socket or power circuit receptacle and you have power lifting! Waiting time becomes working time. You increase production, reduce costs, maintain top efficiency of your workmen all day long, and *increase profits.*

"Budgit" Hoists are light weight, low cost electric hoists (prices start at $119.00) that contain operating conveniences and advantages not found in even the most expensive hoists. Available in 250, 500, 1000, and 2000 pounds lifting capacity with speeds to suit today's tempo. . . . You can put "Budgit" Hoists to work immediately! There is nothing else to buy! . . . You simply hang up, plug in, and Use!

Send for Free catalog that contains complete information and prices. Also, "Time Savings Calculator" that shows savings "Budgit" Hoists earn.

"Budgit" Hoists are obtainable quickly from a Distributor's stock near you.

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Makers of all types and sizes of cranes and electric hoists for more than half a century.

N. M. T. B. Opposes War

A FIRM STAND against America's participation in the European war was taken by Wendell E. Whipp, President of the National Machine Tool Builders' Ass'n and President of The Monarch Machine Tool Co., Sidney, Ohio, in an address before the annual convention of the Association in Cleveland.

"I think we should make it clear to the public of the United States," Whipp said, "that although the machine tool re-equipment of the plants and factories of America has an important bearing upon national defense, the machine tool builders of this country are, nevertheless, absolutely opposed to war, and will co-operate to the fullest extent in helping in any possible way to keep this country out of war.

"The net result of war is always a net loss. This applies to the victor and the vanquished alike. No actual prosperity can be gained by deflecting the ingenuity and the energy of mankind to purposes of destruction. Real wealth is created only by the production of goods and services which add to the possessions and the welfare of humanity.

"Humanity cannot build for war and expect to enjoy the rewards of peace. Those who build for war must expect to share the losses inevitably resultant upon war. Any prosperity stimulated by war is a false prosperity, and must be paid for a thousand times over by the loss in life, the loss in resources, and the loss in business activity throughout the world, which inevitably follows war.

"There is danger that emotionalism and indignation may carry this country headlong into the present war, almost before we are aware of it. This would be a supreme disaster.

"War today in its very nature requires regimentation. And regimentation involves the loss of the very freedom which constitutes the basic element of democracy. Instead of losing democracy at home to fight for it abroad, it would seem far more important to remain at peace and assure democracy at home.

"It seems to me that the major job which we have before us today is that of reconditioning our internal economic and business structure. We must get the businesses of the United States back once more upon a full-time production basis. We must somehow manage to re-employ all of the people who are actually employable, but who are still at this moment out of work. We must put the plants and factories of this country to work turning out more of the actual physical products which really constitute wealth. We must build up the resources of this country, and develop an internal strength and stability which will enable us to meet any contingencies which the future may bring forth.

"The social and economic function of the machine tool industry is to raise the standard of living by helping to cut the cost and improve the quality of the

a century.

devices and conveniences by and with which people live. As long as we keep this premise clearly before us, we can steer a safe course through the troubled times that lie ahead."

In discussing the remarkable increase in business received by the machine tool industry in September, Whipp pointed out that a very large share of the increase came from domestic manufacturers, most of them in fields unrelated to war preparedness.

"While war may have supplied the occasion for the current great upswing in machine tool orders in this country," Whipp said, "obsolescence and the need for modernization constitute the real reasons."

Tool Ass'n Passes Resolutions

The nation's machine tool builders went on record as "opposed to warfare and in favor of the maintenance of honorable peace in the United States," in a resolution passed at a convention session of the National Machine Tool Builders' Ass'n held in Cleveland, October 3rd. The resolution in full states:

WHEREAS: The members of the National Machine Tool Builders' Ass'n hold firmly to their conviction that real wealth is created only by the production of those goods and services which add to the possessions and the welfare of all the people;

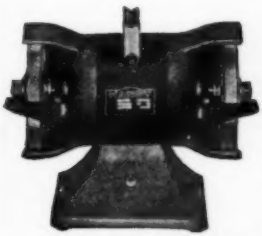
WHEREAS: War is destructive to those benefits to humanity;

THEREFORE, BE IT RESOLVED: That we, the members of the National Machine Tool Builders' Ass'n, assembled in convention at Cleveland, declare ourselves opposed to warfare, and in favor of the maintenance of honorable peace in the United States.

Officers of the Association elected for the coming year are:

Pres., John E. Lovely, Vice Pres., Jones & Lamson Machine Co., Springfield, Vt.; 1st Vice Pres., Frederick V. Geier, Pres., The Cincinnati Milling Machine Co., Oakley, Cincinnati, O.; 2nd Vice Pres., Clifford S. Stilwell, Executive Vice President, The Warner & Swasey Co., Cleveland; Treas., Wendell E. Whipp, Pres., The Monarch Machine Tool Co., Sidney, O.; Sec'y, Mrs. Frida F. Selbert; General Manager, Tell Berna.

New Officials at the helm of the National Machine Tool Builders Association—(Center) President John E. Lovely (Vice President, Jones & Lamson Machine Co., Springfield, Vt. (Left) First Vice President, Frederick V. Geier, (President, The Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio) (Right) Second Vice President, Clifford S. Stilwell (Executive Vice President, The Warner & Swasey Co., Cleveland, Ohio).



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4 SPEEDS AT YOUR COMMAND
SCHULTES FOUR SPEED DRIVE

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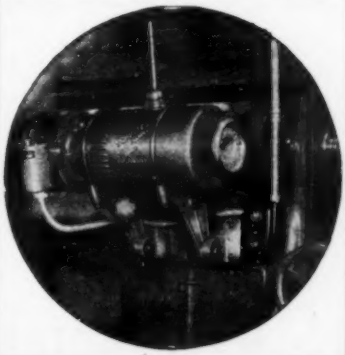
The modern drives are equally valuable for lathes, milling machines, drills or punch presses. They're low in first cost and easily attached. Soon repay their cost through savings which they make possible.



Schultes Drives incorporate all the latest engineering improvements and advantages. They're dependable, economical to operate and maintain, and will show definite savings in production costs.

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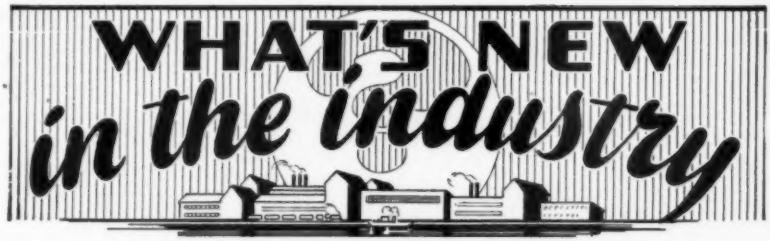


Landis Threading Innovations

It is customary to look to Landis for threading developments—and the latest of these are especially interesting.

The illustration shows an installation of automatic forming and threading machines. Introduced at the 1927 Show, these units have been refined and improved in many details.

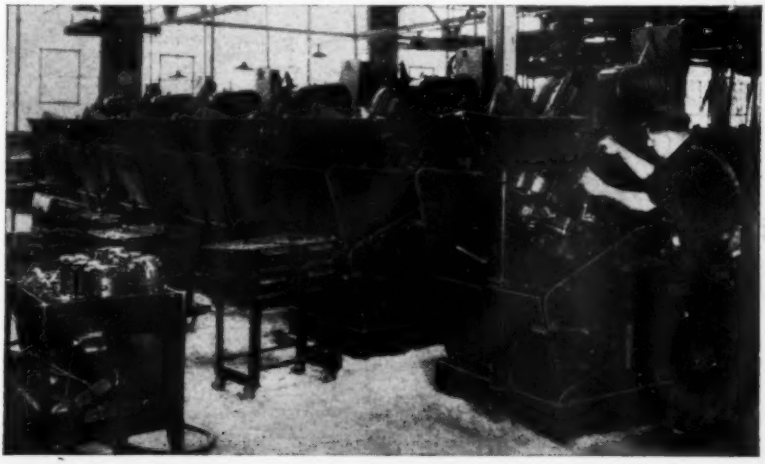
Covering a diametrical range from 3/16" to ¾" inclusive, the standard capacity permits handling bolts from 1" to 6" long. A simple accessory increases the length capacity to 7½". Still another accessory permits the handling of studs and similar work.

Typical of its ordinary performance is the pointing and threading of ⅜" x 2½" hex head cap screws at the rate of 20 per minute.

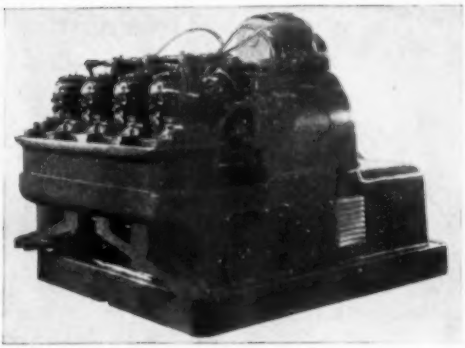
The new four-spindle semi-automatic threading machine is a versatile performer. The unit shown covers a capacity range of from ¼" to ⅞" inclusive. It is so flexible in operation that it may be used on almost any kind of threading job within its diametrical capacity.

The makers stress the fact that its production possibilities are limited only by the capabilities of the operator. For example, threading more than 1900 hollow head set screws per hour.

On this kind of a job, the operator loads the small driving mandrels which hold the screws during the threading operations. These mandrels are locat-



ed on a four-position indexing fixture which carries the screws to the threading position. The die head advances, completes the threading operation and returns to its original position, after which the indexing fixture rotates to bring a new piece of work into the threading position. During this next threading operation the threaded screw is automatically ejected from its mandrel and the operator reloads at the fourth position.



The four-spindle unit is equally adaptable for long rods, bolts, cap screws, etc. It is recommended especially for bolt and screw plants, or for the manufacture of any small threaded parts which must be handled on a high production basis.

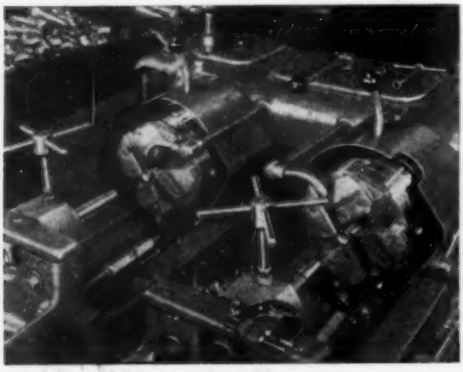
Where quantities of chasers must be ground on a production basis, the new type No. 1 Landis chaser grinder is recommended. It has numerous refinements and improvements.

The Lanhydro closeup shows a unit employed on automotive parts, for hollow milling or "turning" operations.

These Lanhydro threading machines are automatic in operation. The work grips open and close automatically, carriage movement is automatic—opening and closing of the die heads is effected by an hydraulically controlled cycle.

A late Landis development is a double head threading machine, hydraulically operated. Units of this type are being used successfully by makers of railroad accessories and conduit.

Typical of the units used by many leading manufacturers of oil well tubular goods for the production threading of casing, tubing and drill pipe is the big 13⅜" receding chaser pipe machine. The rated capacity is 8⅛" to 13⅜" inclusive, although by the use of auxiliary chaser holders, the range can be extended down to 4½".



A difficult threading operation recently performed on a Landmaco 2" threading machine involved cutting a continuous thread on bars five feet long. There were afterwards cut into very short lengths to be used in adjustable open end wrenches. A modified Buttress thread form was employed, and since an especially good finish was required, special chasers were used which performed a roughing and finishing cut at one pass.

Bulletins on any items in the broad Landis line may be obtained by addressing the Landis Machine Co., Waynesboro, Pa.

Waynesboro, Pa.

"Microlite" Protective Coating

The Michigan Chrome Co., 6340 East Jefferson Ave., Detroit, offers a new protective coating material to be used for insulating plating racks. It is asserted that this coating, known as "Microlite," can be applied faster and will air dry faster than the usual plating rack protective coatings. Dipping speed is approximately five times faster than that of other coatings. Under average drying conditions, one coat can be applied each hour. The seven coats recommended to prepare the racks for plating use can be applied in one day and the racks can be used the following morning.

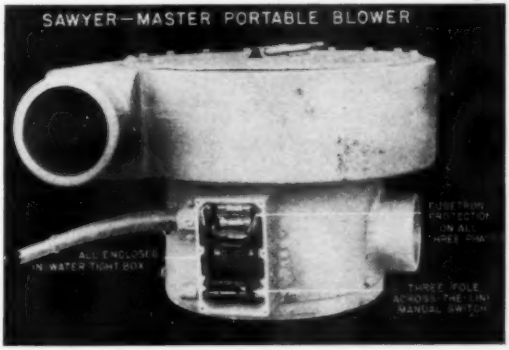
This material has been developed as an all-purpose protective material for plating racks, used in any solution or acid or in any process. It is not affected through the complete cycle of plating. It is effective in all types of cleaning operations. It contains no pigments but is perfectly clear in appearance both before and after it is applied.

It is of a low viscosity which permits the application of extremely thin—yet effective—coatings. No thinner is required except for an occasional surface spraying when racks are being dipped. It assures smooth, uniform coatings, and there is practically no dripping of the material after the racks have been dipped. Webbing or pocketing between contact points is reduced to a minimum.

The material can be applied either by hand or machine dipping. It is applied directly on the metal surface of the rack, with no treatment necessary other than cleaning the surface to be coated. No tape or any special treatment is required. If a rack should become damaged in process, it is only necessary to touch up the damaged section—the patch becoming an integral part of the entire coating.

Sawyer Perfects Compact Blower Unit

A distinct innovation in blower construction is presented by the new Sawyer Master Pressure Blower which was designed primarily for exhausting toxic fumes from welding operations where space is at a premium and an advantage lies in exhausting through a hose rather than directly through the machine. It is capable of moving a large quantity of air through hose up to 75 feet in length.



The specially built motor is entirely enclosed and is placed in the intake air housing in such a way that the entire volume of air delivered by the blower passes completely around the motor, effectively air cooling it.

The elimination of brushes, commutators, gears and centrifugal switches simplifies the construction and reduces size, weight and maintenance expense. It is claimed that the Sawyer motor delivers a given horsepower with about half the weight of other motors, and that the power pull out is twice the rated capacity.

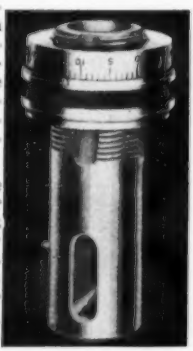
The blower is furnished with one,

two, or four inlet ports, with inside diameters dimensioned according to the capacity of the blower. Inlet ports are screened to prevent dust and dirt from affecting the impeller.

Compactness is one of the main advantages. Height is 15" and the entire unit can be passed through an opening 21" in diameter. The motor is rated at one h.p., and operates on 220 volt, 3-phase, 60 cycle current at 3600 r.p.m. Under these conditions the capacity of the Sawyer Blower is said to be exceptionaly high in proportion to size and power consumption. Tests show, it is asserted, that 680 cubic feet of air can be handled per minute, with static pressure 3⅛" or higher, at 68° F. Air velocity is approximately a mile a minute.

Further information will be supplied by Sawyer Electrical Mfg. Co., 5715 E. Leneve Ave., Los Angeles, Cal., manufacturers of aerial grinders and other tools powered with special motors.

Speedier Set-Ups With the Micro-Nut



An interesting device known as an Adjustable Micro-Nut has been developed recently by the engineering department of The Gairing Tool Co., Detroit, Mich.

Adaptable for use on either single or multiple spindles, it is claimed that they quickly and accurately set end-cutting tools to their correct length and, in the case of multiple spindles, in proper relation to each other.

Graduated to permit adjustments ranging from .001 to .020", this is accomplished by an adjustable sleeve feature of the nut that works independently of the screw. The relative position of the cutting tool can be extended or retracted and measured adjustments can be made without guessing or interfering with the entire tool set-up.

In cases where the cutting tool must be extended or retracted more than .020", the set required is easily and quickly made by loosening the Allen screw in the Micro-Nut and turning the nut on the screw threads at an approximate estimate of the extension or retraction required (one complete turn of the whole unit equals .083". —Allen screw stations at quarter turns). Then the Allen screw is tightened and the final precision adjustment is made on the graduated Micro-Nut.

The manufacturer claims that these Adjustable Micro-Nuts, when used in connection with any standard adapter assembly or with tool holders and boring bars, will give the operator everything he has ever had before plus a speed and precisioned accuracy that save time and work spoilage. They reduce the attainment of close tolerances to an automatic method of simple arithmetic.

Rust Prevention

Rust is the result of oxidation (at normal temperatures) in the presence of moisture. If the surface of the metal is absolutely dry there can be little reaction between oxygen and iron or steel. However, in the course of production of such materials they often come in contact with moisture in one form or another; this moisture, of course should be completely removed from the steel before slushing oil is applied if freedom from rust formation is to be assured.

The most important consideration regarding rust prevention is that as long as the metal can be kept warmer than the surrounding air, moisture will not condense thereon from the atmosphere. The next step after completely drying the surface is to treat the steel with a suitable rust preventative which will completely coat the surface, and prevent any possibility of wetting by moisture while being held in storage.

The ideal protective film of petroleum base (slushing oil) should be easy to apply; give maximum protection against rusting; be easy to remove when protection is no longer required.

Slushing oils as generally used will fall into two broad classifications: Straight mineral oils and special rustproofing oils of petroleum base.

Special rustproofing compounds are particularly useful where storage conditions are poor and added protection is needed.

Detailed information on rust prevention, is contained in Sept. '39 copy of Lubrication published by the Texas Co., 135 E. 42nd St., New York.

Allis Introduces New Adjustable Speed Motors

The Louis Allis Co. of Milwaukee asserts that its new Ajusto-Spede motor incorporates an entirely new principle in alternating current adjustable speed motors, as well as many new advantages and economies heretofore not available.

The motor is a combination of an eddy current clutch and a standard constant speed a.c. squirrel cage motor. There is no mechanical contact between the driving and driven members of the unit.

The speed and torque variations are obtained by controlling the magnetic excitation of the clutch, thereby obtaining any desired slip.

The makers list the following functions performed by this unit without jar, shock or stress on any of the driven parts.

Gradual or quick acceleration of load, rapid intermittent starting and disconnecting load, absorbing of tortional impulses and vibrations—

Among the special features claimed are:—an unusually wide range of speed variations from zero to full speed at full load torque; continuous operation at low speeds without overheating; and remote control available as standard at slight extra cost.

Copy of a new eight page Bulletin No. 611 will be sent on request by The Louis Allis Co., Milwaukee, Wis.

Multi-Story or Single Story?

A graphic comparison of relative building and operating costs in single story and multi-story industrial buildings, and a discussion of their relative advantages and disadvantages, is presented by The Austin Co., in the fifth edition of its booklet, "Your New Plant —Multi-story or Single Story—Which?"

In the face of widespread interest in air conditioning and other controls for industrial plants, the new edition devotes special consideration to the adaptability of single story and multi-story plants to such installations.

Copies of the study can be obtained from The Austin Co., Cleveland, Ohio, or from any of its 13 district offices.

Michigan Tool Announces New Gear Lappers

A completely new line of gear lappers, of the two-lap type, employing the crossed - axis method of operating, original with Michigan gear finishers, is announced by Michigan Tool Co., Detroit.

Automatic in operation, the new machines are available in vertical and horizontal models, the latter being illustrated.

The new machines are provided with electrical controls which permit adjustment of the lapping cycle to meet virtually every variation desired. The new line is designed for high production lapping of moderate and small sized gears (½ to 8" diameter) and is not restricted as to pitch of gears which may be lapped. Machines are also available in 1 to 12" capacity.

Fundamentally, the new machines employ a relatively low surface speed, with high speed of reciprocation of the laps across the gear faces. By means of a single adjustment it is possible to vary this speed from 90 to 300 reciprocations per minute. A change-gear box is provided for the lap spindle, through which the latter may be operated at speeds ranging from 52 to 283 r.p.m. A third adjustment permits selection of desired reciprocating stroke length.

Two timers are provided to permit individual adjustment of desired lapping time on either side of the teeth, the range available being from two seconds to 20 minutes in either direction.

In operation, the two laps are mounted on the lap spindles, while the gear to be lapped is mounted between live centers between the laps. The lap spindle heads are adjusted to provide the correct amount of crossed-axis (Lap angle minus gear angle).

Individual motor drives are used for driving lap spindles and for reciprocating the work. The former drives one lap spindle, the lap driving the work, and the work in turn driving

the second lap, whose spindle is equipped with an hydraulic brake. The second motor through an eccentric drive, rapidly oscillates the work carrying head in line with the axis of the gear.

With the timers set, starting the machine results in (1) revolving laps and spindle in one direction for the first pre-selected period, and (2) automatic reversal and lapping of the gear in the opposite direction for the second pre-selected period. The machine then stops automatically. One lap spindle is thereupon retracted by means of a hand-lever, permitting removal of the lapped gear.

The next gear is then loaded in mesh with the second lap, and the retracted lap again brought into lapping position by means of the control handle. The arrangement insures that laps and gear will always mesh properly, preventing damage to laps.

Lapping compound is supplied through a special pump. Lubrication of vital parts of the machine is through a manifold oiler, elminating the necessity of individually oiling the various parts.

Peace Products Show Greater Increase

"The great bulk of the increase in domestic machine tool buying which has occurred during the last month has originated with companies engaged in the manufacture of peace-time products of the country." Charles J. Stilwell, Executive Vice President of Warner & Swasey Co., issued this statement recently after reviewing current orders placed with the company.

Contrary to widespread belief, the present activity in the machine tool field represents a response to the upward trend in general business since last Spring, plus the added stimulus provided by the rush to increase inventories incidental to expectations of a war boom.

"A review of current orders now on our books," said Mr. Stilwell, "shows that practically every type of industry requiring machine tools—and this includes by far the major share of all manufacturing enterprises of the country — is actively in the market for machine tools.

"While it is true that orders from airplane manufacturers and other industries more or less closely identified with national defense have been substantial, the great bulk of the increase has been with manufacturers of peace-time products.

"In the case of our own Company which I believe is typical, a surprising upturn has materialized from practically all of the domestic machine tool using industries we serve."

Modern Develops New Feed Handle

The Modern Collet & Machine Co., 401 Salliotte St., Ecorse, Mich., has recently introduced a new type of feed handle for use on Gridley automatic screw machines.

The new feed handle is so adjusted that, in the meshing of the gears and feed box, the gears will positively stay meshed. This eliminates rattle and unnecessary wear on the feed box gears as well as on the feed box speed change holes.

In designing this feed handle, provisions were made for durability as well as simplification, to the end of reducing repair costs. With the old type handle, when breakage or wear of any part occurred, it was necessary to replace almost the entire handle. With the Modern Collet feed handle, however, the parts are so constructed and arranged that any individual part may be replaced quickly and easily.

Machine Guns of Industry

The Van Dorn Electric Tool Co., Towson, Md., has just released to the trade a handbook of portable electric hammers. This comprehensive and profusely illustrated work gives the details of operation of the Van Dorn portable electric hammer, typical uses, and special pointers on maintenance and operation of the tool itself.

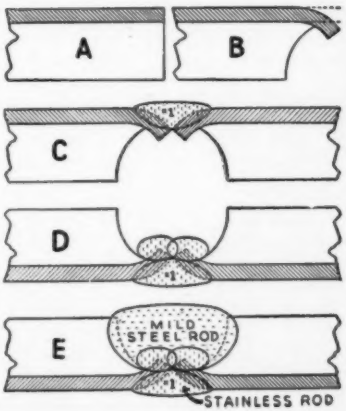
This book is a veritable storehouse of information for concrete, stone and brick contractors; plumbers; painters; carpenters; electricians; welders; modernization contractors; tree surgeons; and maintenance men because of the almost limitless uses for the portable electric hammer in the building and industrial fields.

Welding Stainless-Clad Steel

The Composite Steel Division of the Jessop Steel Co., 603 Green St., Washington, Pa., has perfected a new method of welding stainless - clad steel that eliminates danger of reduction in corrosion resistance in the weld zone. In the past, some difficulty has been found in welding stainless-clad steel, due to the admixture of mild steel with stainless steel in the weld zone. This often occurred even when stainless rods were used throughout.

The new method maintains the full corrosion resistance of the weld zone, even when a mild steel rod is used for welding the backing. Fig. 1 is an unretouched photograph (top and cross sectional view) of a piece of welded Silver-Ply, a stainless-clad steel manufactured by Jessop, which has been subjected to a 24 hour exposure of a 20% salt spray mist at Pittsburgh Testing Laboratory. It will be noted from top view, that there is no more corrosion in the weld zone than in adjacent parts of the piece.

Fig. 2 illustrates the procedure for welding stainless-clad steel by the new method. Fig. 2A shows the plate as supplied, the lined portion representing the cladding. The plate is then scarfed and the cladding bent down with a follow-up tool or hammer, as illustrated in Fig. 2B. The primary weld (bead No. 1—Fig. 2C) is made with a ⅛-inch diameter stainless steel coated rod at the juncture of the two claddings. The two plates are then turned over and secondary welds made



on underside of exposed cladding, as indicated in Fig. 2D, using a 3/16-inch diameter stainless steel coated rod. The final weld (joining the mild steel backing) may be made with a ¼-inch diameter mild steel coated rod. Fig. 2E represents the completed weld; bead No. 1 is then ground flat with the cladding.

In all cases where stainless rods are used, the rod should be richer in alloy than the cladding; for example, on Type 304 Silver-Ply use 25-12 rod; on Type 316 Silver-Ply use Type 317 rod. Lowest possible amperage and fastest possible welding time are recommended.

The procedure outlined permits great savings in cost of rods, since mild steel may be used to weld the backing.

Carboloy Torch Brazing Bulletin

Carboloy Co., Inc., Detroit, manufacturers of cemented carbide tools, dies and wheel dressers, has issued a bulletin giving the latest methods of torch brazing Carboloy tools. It describes the process by which Carboloy users can braze tips into tool shanks.

Suggestions are given as to materials required, shank preparation, tip preparation braze assemblies, methods of cooling, designs for enclosed tips, and braze assemblies for special and multi-point tools.

Users and prospective users of Carboloy cemented carbides will find this booklet an excellent guide in making their own tools.

Copies of this bulletin (GT-116) may be obtained from Carboloy Co., Inc., 11139 East 8 Mile Road, Detroit, Mich.

Exports Rise

Totaling $25,807,101, our exports of industrial machinery in August were 17% greater than the corresponding shipments in 1938, according to the Machinery Division of the Department of Commerce. The increase was well distributed over the various groups, ranging from 7% in mining, well and pumping machinery to 63% in textile, sewing and show machinery.

Machine tools led the advance in metal-working equipment, contributing importantly to the 14% gain in total foreign sales of power-driven metal-working machinery. The total in this class was $9,870,911 compared with $8,625,729 in August 1938.

Lathe shipments totaled $1,810,750 against $1,329,822 a year ago.

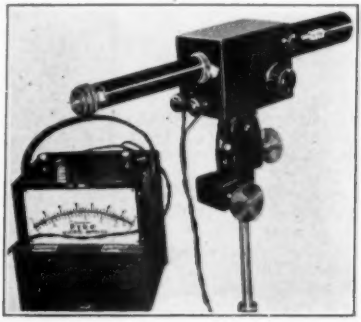
Thread cutting and automatic screw machines amounted to $568,977 as compared with $187,892; milling machines $1,686,018 — $1,546,927; radial drills $74,503 — $17,450; planers and shapers $338,547 — $256,416; internal grinders $465,997 — $386,792; tool, cutter and universal grinding machines, $436, 371 — $306, 150; sheet and plate metal-working machines, $612,220—$689,867; forging machinery, $359,648—$95,404; rolling mill machinery, $755,812—$874,220 and foundry equipment, $120,257—$228,787.

Foreign sales of metal-working (except power-driven) equipment were 32% above August 1938 with a total of $439,774.

August exports of power generating equipment (including electrical and automotive types) amounted to $1,560,056—an advance of 13%. Most items in this category participated in the gain, the more important items including steam boilers, Diesel and semi-Diesel engines, other stationary and portable engines, accessories and parts.

Micro-Optical Pyrometers

This new instrument permits measuring the temperatures of very small objects such as incandescent lamp filaments etc. It has a twenty-fold magnification of the object which is provided by means of an optical arrangement of high candle power and 37 m/m aperture. The image of the smallest wire or filament under observation will fill the optical field and completely cover the tip of the pyrometer filament range.



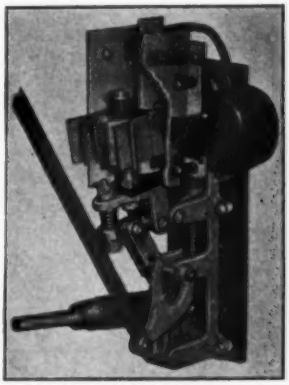
The instrument operates on the principle of a disappearing filament and is furnished with a direct reading scale over the range from 600oC to 3000oC and higher. The ammeter is compensated against variations in room temperature and has a so-called suppressed zero point in order to make better use of the scale, but only as far as is permissible with regard to constancy. Battery consists of four ordinary commercial flashlight cells. The unit is furnished with rigid support and tripod, the instrument holder being equipped with a fine precision double worm gear arrangement for the most delicate adjustments in any desired direction.

For further details please address The Pyrometer Instrument Co.,102-105 Lafayette Str., New York, City.

Lafayette Str., New York, City.

Knee-Action for Spot Welder Contactor

Superseding the usual dog or ratchet mechanism, the Pier Equipment Mfg. Co., Benton Harbor, Mich., makers of Ace-Peer Welders have incorporated a three element linkage design in their latest contactor or trip switch. This principle is like "knee-action" or toggle, closing the contactor until the knee joint pushes against the trip control lever, when the knee bends and opens the contactor. By changing the position of the trip control lever, the period of the welding stroke during which current flows and the amount of contact are determined. For thin metals, for example, the operator can select an extremely short welding time (2 to 3 cycles).



Mechanical parts of this new contactor, shown in the accompanying photograph, are steel and bronze with cotter pins used wherever possible and a minimum of screws and nuts. Magnetic blowouts quench the arc and save the contacts; refractory arc shields confine the arc, prevent wandering and burning. The contacts and their mountings are of heavy sections of rolled copper, self-aligning, easily adjustable for wear and easily replaced. It is claimed that useful contact life is more than doubled.

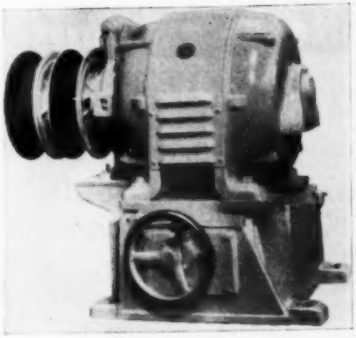
U. S. Electrical Offers Multiple Belt Variable Speed Drive

A new development is announced by U. S. Electrical Mfg. Co.,—a multiple belt for variable speed drive motors. Speed changes on the unit are effected by turning the hand wheel which shifts the motor on the base and this moves the yoke which actuates the pulleys.

A new lubrication system provides a thorough method of greasing the pulley sliding fits. A hollow section of shaft is constructed through the pulleys and the grease is ejected through orifices from the hollow section of shaft to the sliding surfaces. The end of the motor shaft is also equipped with a grease fitting.

The belt may be tightened or loosened without shifting the entire base. This adjustment is made by working a set screw which turns the eccentric bushing located at the pivot point of the shifting yoke arm.

The sets of ways on the motor mounting base and the main unit base are very accurately machined; thus correct



alignment is assured, and a rigid sliding support for the motor is attained. Bulletins are available at U. S. Electrical Motors, Inc., Dept. 65, 80 Thirty-fourth Street, Brooklyn, New York.

Bliss Enclosed Design 4-E-10-120 Press

The E. W. Bliss Co., 53rd St and 2nd Ave., Brooklyn, N. Y. recently added a complete line of enclosed presses for the automobile trade and the stamping field. The unit illustrated is of the four eccentric type, the slide being actuated by a connection to each corner which is in turn driven by an eccentric. The eccentric shafts run front to back with the main bearings mounted in the heavy crown ribs, distributing the thrust loads throughout the crown. The press is double geared with herringbone steel gearing throughout the main drive, twin driving gears on the crankshafts, and with all gears running in a bath of oil.

The clutch is of the latest Bliss improved design, operated by electric push button control. Flywheel is Timken roller bearing mounted and can be stopped by a brake after power has been shut off. Barrel type connections on slide give an adjustment of six

L-W LATHE CHUCKS

4 JAW INDEPENDENT L-W LATHE CHUCKS

Semi-Steel body, ribbed construction, hardened and ground steel reversible jaws—Made to stand the gaff. We are proud to offer such Hi-quality at low cost.

10" Size	$27.00
12" Size	31.00
14" Size	36.00
16" Size	45.00
18" Size	58.50

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Also Mfr's. of
Magnetic Chucks
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L-W CHUCK CO.

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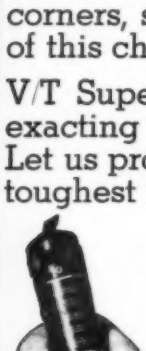
CHICAGO MOUNTED WHEELS OF V/T SUPE

150% LONGER LIFE

Chicago Mounted Wheels made of the new V/T Super Bond prove by tests conducted in many plants on snagging and exacting operations to have from 150% to 300% longer life. They're tougher; can take more punishment; grind more pieces per wheel, faster and without sacrifice of cutting action.

V/T Super Bond holds its original shape longer. Wheel will not ridge on grinding welds, sharp corners, sinking dies, barbering, and other work of this character.

V/T Super Bond meets the challenge of today's exacting requirements. Cuts your grinding cost. Let us prove it to you in your own plant on your toughest mounted wheel job



HANDEE TOOL OF 1001 USES

Here's a small "power house" that can be carried to any part of the shop and used wherever there is an electric outlet. Repairs hard-to-get-at parts on machinery without removing the part—smooths off rough spots on dies and moulds—cleans delicate mechanisms—grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, cleans, etc. Uses 300 accessories. There are more Handees in use today than all other tools of this type combined.

TRY A HANDEE FOR 10 DAYS IN YOUR OWN PLANT

☐ Send wheel without cost. Size .....

☐ Catalog of Handee Products.

☐ De Luxe Handee on 10 Days' Trial

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De Luxe model weighs 12 oz. 25,000 r. p. m. $18.50 postpaid with 6 Accessories.

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1101 W. Monroe St., Dept.
Canadian Distributors: Canadian Trade Corp., Ltd.

PER BOND

YES - SOMETHING NEW UNDER THE SUN

GREATEST FORWARD STEP IN 30 YEARS

V/T Super Bond is one of the most important developments in mounted wheels. Wherever the use of a tough, hard bond that will stand the gaff is required, V/T Super Bond will be found without peer. Nothing can compare with it in endurance, stamina and performance. There is a shape and size to handle every grinding job faster, better and at lower cost.

Chicago Mounted Wheels

✓ The FIRST small abrasive wheels mounted on steel mandrels to be offered to industry.

✓ The FIRST with this special new and exclusive bond—V/T Super Bond, unequalled in strength and long life.

LET US SEND YOU ONE

To prove the superiority of V/T Bond, let us send you a CHICAGO Mounted Wheel without cost or obligation. Tell us the kind of job, type of equipment and size you want to use to make your own test.

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ality Products for 40 Years
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TOOLS

RECUT—RECONDITIONED—REBUILT

Do your Tools need Recutting, Reconditioning, or Rebuilding? We have complete facilities for satisfying your most exacting demands. For all your Tool Salvage problems we have the answer.

Let us Recut your cutters, drills, reamers, end mills and files; Recondition your pneumatic tools and parts; Hard Chrome your machine parts and dies. Write today for our complete catalogs.

HARD CHROME PLATING

EASTERN CUTTER SALVAGE CORP.
Newark, New Jersey

MASTER TOOL CO., INC.
Cleveland, Ohio

THE MASTER CHROME SERVICE, INC.
Cleveland, Ohio

inches by electric motor. The slide is precision gibbed at all four corners with the sliding surface lined with bronze. Counterbalance cylinders are mounted in the uprights and bed, preserving the lines of the press.

The press operates at 14 strokes per minute. Bed area is 80" F. to B. by 120" R. to L. The die space, bed to slide, stroke down adjustment up, is 60", with the stroke of the slide 24". Rated capacity is 750 tons.

This new design is now available in many different sizes of the double crank, double eccentric, four crank, and four eccentric presses.

Laminated Shim Applications

An interesting Application Chart is offered by the Laminated Shim Co., Inc., 21-82-44th Ave., Long Island City, N. Y.

It places in the hands of present and potential shim users a comprehensive survey of proved applications for laminated shims or shim stock.

The applications listed are arranged for easy reference. Generous illustration of installation methods adds value to the chart as a handy guide. With it, any industrialist can quickly check his shim applications, to ascertain whether or not he is taking full advantage of the use of laminated shims throughout all of his machine assemblies or servicing.

Super Masonry Drill Chart

The correct masonry drill sizes for a representative list of makes and sizes of expansion shields or plugs are shown on an attractive new chart issued by Super Tool Co., 21650 Hoover Road, Detroit. In a vertical column, some 36 different commercial anchors and shields are listed. Across the top, diameters from 1/8" up are listed and in columns below, the proper masonry drill sizes are given. The chart is 11¼ x17", printed on heavy paper, with metal reinforcing strips top and bottom. Copies may be had on request.

Beg Your Pardon

In the October ad of David J. Ross & Co., Benton Harbor, Mich., it was inadvertently stated that stands would be provided for Rousselle Punch Presses at $15.00 extra. It should have been explained that this is the price of the stand for the No. 0 model only. Stand for the No. 1 model is supplied for $25.00 extra. A specially designed guard for motor drive is available at $10.00 extra.

The small, speedy, versatile Rousselle punch presses are being adopted extensively to relieve larger, heavier presses from the many small jobs to be found in most plants. Because of their long stroke and ready adaptability, Rousselle presses are especially useful on trimming deep die castings and other types of deep draw work within their capacity.

Uses For New Thor Bantam

The Independent Pneumatic Tool Co., 612 W. Jackson Blvd., Chicago, have recently marketed a new 5½", 17 oz., rotary air grinder. For complete data and specifications of this new Thor tool they have issued a circular. It gives the uses for the new tool, (which is called Bantam) and depicts them in many interesting close-up action photos. All grinding wheels and accessories available are pictured and priced to give an idea of the versatility of this tool. This circular is colorful and instructive and gives the pertinent information in an easy to read style. It can be obtained by writing for circular P20.

Kennametal Cutting Chart

A new chart giving the correct grade of Kennametal for machining 21 types of metals, together with recommended cutting speeds, has just been made available by McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa. Materials listed include carbon steels, nickel chrome steels, nickel chrome molybdenum, chromium steels, high speed steels, Monel metal, free cutting steels and non-ferrous metals, in various states of hardness.

The reverse side of the chart contains practical data on how to machine with Kennametal and includes two designs for grinding tools to produce crescent shaped chips or coiled chips as desired; also, the correct tool shape for interrupted cutting with Kennametal. The new chart is printed on durable varnish cardboard stock and has a hole punched at the top so that it may be easily hung from the wall or lathe.

Simplex Welding and Production Vises

A double swivel arrangement in the new Simplex welders' vise gives quick and easy angular positioning for a wide range of welding jobs.

In an instant the vise can be changed to a regular swivel base machinists' type.

Three models are available with 3¾", 4¼" and 4¾" jaws, opening to 5", 6" and 7" respectively.

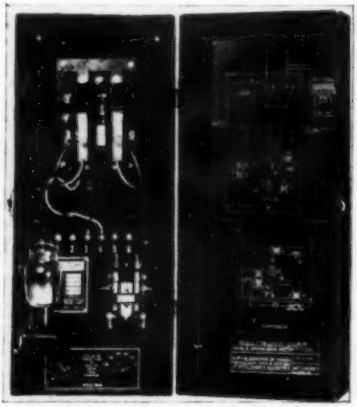
The Simplex production vise is designed to save time on production filing, fitting or assembly work. Raising or lowering the vise handle instantly opens or closes the vise. A cam in the slide gives a ¼" throw to enable work to be inserted or removed. Setting the vise for the job, the handle is raised and then the knurled knob is turned until the jaw opening is ¼" more than the width of the piece.

Three sizes are available each, in the stationary base and swivel base types.

Address The Desmond-Stephan Mfg. Co., Urbana, Ohio for bulletins giving complete information.

Modernizing Manually Operated Spot Welders

A new low cost combination weld timer and contactor to provide positive weld-timing control for virtually any manually operated 1 to 15 KVA spot welder and capable of such accuracy as to permit the welding of stainless steel, aluminum or brass with such equipment, is announced by Weltronic Corp., 2832 East Grand Blvd., Detroit, Mich.



Available for either 110, 220 or 440 voltages and 25, 50 or 60 cycle frequencies, the new timer - contactor unit, known as "Model 90-53" is adjustable in one cycle steps over the standard 1 to 60 cycle timing range.

Featuring low cost maintenance as a result of the absence of any moving time elements and having removable contacts for quick replacement, the device provides a compact, easily installed means of controlling timing accuracy for any type of work within the capacity of the spot welder with which it is used.

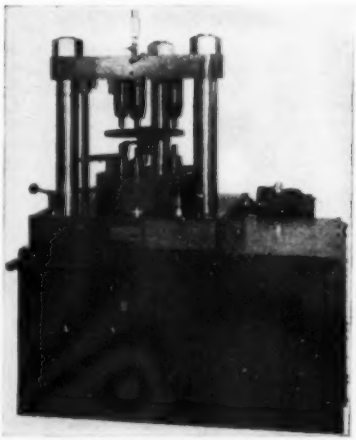
The unit consists of a single electronic tube, a relay and a contactor together with time selector switch mounted in a compact, spring hinged cover case.

A bulletin describing the unit and giving prices is available on request.

Gear and Hub Assembly Riveter Added to Hanna Line

A gear and hub assembly riveter is the latest addition to the Hanna electric hydraulic riveting line. These presses are of the strain rod and platen type. There are three pairs of dies for driving three rivets 120° apart, simultaneously. The upper set of three dies is stationary and the rivets are headed by a set of three lower movable dies. Each pair of dies acts independently of the other pairs although the tonnage on all pairs is exactly equalized. Thus, no harm to the assembly or to the press will result should two rivets or one rivet be struck instead of three.

The press is provided with a swing-out arm and mandrel for loading and sticking (assembly) of the work in a handy and safe manner. The rivets are inserted from above with the manufactured head up. When the swing-out arm is swung in against the stop, the axis of the assembly is accurately



located in relation to the dies. The operator then merely rotates the work until a set of three rivets comes into index with the dies. Depressing a treadle causes the assembly to be lifted to nest the manufactured heads of the rivets up into the stationary upper die cups. The press is controlled by two hand levers, a safety feature which assures the operator's hands being free of the dies.

Operation is by low pressure oil (1,000 lbs. per square inch) at which pressure, 25 tons are exerted between each pair of dies. This tonnage is adjustable and accurately maintained. The operation is very rapid — 20 cycles per minute of 3" stroke.

Armstrong Issues Catalog

Armstrong Bros. Tool Co., "The Tool Holder People," Chicago, announce a new (No. C-39) general catalog of all Armstrong lines which include: "Armstrong" Tool Holders; Carbon, Chrome-Vanadium and Detachable Head Socket Wrenches; "C" Clamps; Lathe and Milling Machine Dogs; Turret Lathe and Screw Machine Tools; Ratchet Drills; Bits, Blades and High Speed Steel; Setting-Up Tools; Machine Shop Specialties, and "Armstrong Bros." Pipe Tools.

Solenoid Catalog

A new catalog featuring custom-built solenoids, coils and transformers has been issued by the Dean W. Davis & Co., Inc., of 545 W. Fulton St., Chicago. Graphs giving technical information, plus illustrations of some of the many applications of solenoids, to modern machines are included. A copy of this catalog may be obtained by writing to manufacturer direct.

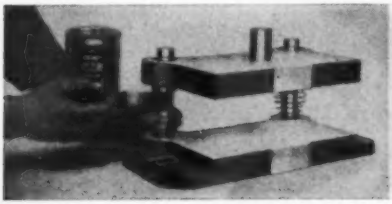
Larger Quarters for Strippit

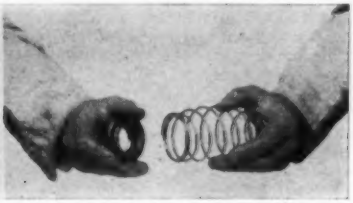
The Strippit Corp., makers of the Wales type adjustable punches and dies, has moved from 1559 Niagara St., Buffalo, N. Y. to new and larger quarters at 1200 Niagara St.

They announce that many new designs and developments will be added to the Strippit line shortly.

Universal Oiler for Die Set Leader Pins

E. A. Baumbach Mfg. Co., 1810 So. Kilbourn Ave., Chicago, announce an automatic oiling system, which is applicable to any make of die set.





It comprises two simple units—a compression spring and an oil retaining ring. The oil retaining ring is made of steel and embodies a high-grade absorbent wick, which fits around the leader pin and rides up and down with the action of the punch press. The low tension spring, acting as a booster, lifts the ring to sufficient height on the up stroke to assure spreading a film of oil on practically the entire length of leader pin.

This system is claimed to save undue wear on bushings, avoid troubles due to faulty lubrication, as well as avoiding loss of valuable press and operating time. By merely stopping the press, compressing the spring by hand and swabbing the leader pin with a brush full of oil, which the wick absorbs, continuous lubrication is obtained.

The oilers are inexpensive and are said to pay for themselves speedily, through savings in bushing replacements alone. They can be used over and over on other jobs. Safety to operator is also promoted, because the spring acts as a guard, deflecting the punch press operator's hand from catching between the pin and bushing.

The oilers are available in sizes to fit leader pins from ¾" to 3" in diameter, with spring lengths of 2½", 4", 6" and 8".

Linde Announces Oxy-Acetylene Cutting Machine

A newly designed, stationary oxy-acetylene cutting machine, which is claimed to offer almost unlimited possibilities in cutting irregular shapes, rings, circles, straight line bevels, and performing several varieties of multiple blowpipe cutting, has been announced by The Linde Air Products Co., 30 East 42nd St., New York, N. Y. Known as the Oxweld CM-23 it includes many new operating advantages and material refinements in addition to the fundamental operating principles of the Oxweld CM-2, which the CM-23 machine now replaces.

Shapes are cut, either automatically with templets or guided by hand direct from a full scale drawing. It is available in two sizes, with cutting ranges of 54 and 81 in. in width by 12 ft. in length. The maximum cutting area is slightly less when the machine is used for hand-tracing. Circles ranging in diameter from 6 in. to 49½ in. (for the smaller size machine) and 72 in. (for the larger size) can be cut. Both sizes may be extended indefinitely longitudinally by the addition of 6-ft. lengths of machine legs and rails, and work support. In addition, the machine can be supplied, on special order, with a transverse capacity of 108 in. or 135 in.

A 3-hose cutting blowpipe is accommodated, of either the low-pressure or medium-pressure type. Multiple blowpipe mountings on the standard-sized models permit simultaneous operation of as many as four blowpipes. Steel plate can be cut up to a thickness of 12 in.

The carriage is driven by a small, variable-speed electric motor (110 volts, a.c. or d.c.). Speed can be varied from 3¼ to 48½ in. per minute when templet-tracing, and from 5½ to 82 in. when hand-tracing. The driving and tracing head is equipped with drive trunnions for automatic templet-tracing, but for hand-tracing of any design or pattern where the machine is not to be used for repetitive cutting,

the mechanical tracing unit can be detached and the line tracer substituted in the offset position to permit hand-guidance of the machine.

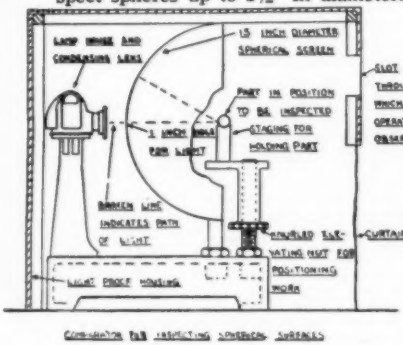
The makers will gladly send full details.

J. & L. Spherical Surface Comparator

The Jones & Lamson Machine Co., Springfield, Vt., announces a new Comparator, specially designed for inspecting spherical surfaces, such as those of balls used in precision ball bearings. Hitherto, the determination of the size and nature of flaws on highly finished surfaces of this type has necessitated the use of expensive instruments and highly skilled operators.

This new Comparator is said to make the inspection of these surfaces a very simple, yet exact procedure, without the necessity for skilled operators and with great economy of time.

The drawing illustrates the method. An enlarged true image of the surface being inspected is projected onto a concave hemispherical screen, 15" at its maximum diameter. Magnification naturally depends on the size of the work, a ¼" ball for example is magnified 60 times, and the instrument may be effectively used to inspect spheres up to 1½" in diameter.



COMBINATION FOR INSPECTING SPHERICAL SURFACES

New Combination Saves Steps in Parts Handling

The combination of two well-known items improves parts storage and handling methods by eliminating the time-wasting transfer of small parts and materials from one container to another. With this combination, parts and materials are taken from one department to another in the same bins.

Stackbins, with full hopper fronts designed for storage, production and assembly work, are stored in the stockroom in Stackracks, individual steel units which lock together to form storage racks of any desired shape or capacity. The Stackbins can be slid out of the Stackracks, carried to any part of the plant—without removal or transfer of the contents, or any part of the contents can be easily removed from the Stackbins without disturbing the storage assembly.

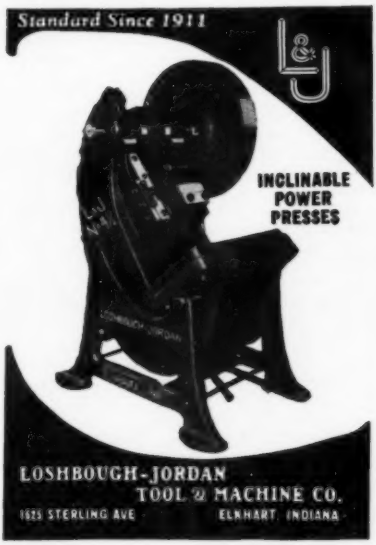
Several leading manufacturers have discovered that the man-hours saved by this Stackbin - Stackrack combination have returned the low initial cost of the installation within short periods. Stackbins and Stackracks are made by Stackbin Corp., 48 Troy St., Providence, R. I.

Whitney Chain Catalog

A handsome new Whitney V-135 silent chain drive catalog gives complete information for the selection and design of silent chain drive.

Included in the 64 pages is a wealth of engineering data, dimensions, horsepower ratings, and sprocket data, as well as, illustrations of typical drives in various industries.

Copies may be obtained from The Whitney Chain & Mfg. Co., Hartford, Conn.



Michigan Issues "Hobbing" Booklet

A practical discussion of all factors involved in the hobbing of gears, splines, etc., including formulae and charts for use by the shop as well as engineering department, is provided in a new booklet just issued by Michigan Tool Co., 7171 E. McNichols Road, Detroit.

Entitled "Hobbing" the booklet covers such topics as:—Setting up hobs, both for average as well as extreme precision work; figuring hobbing time; determination of causes of errors in the finished work; methods of calculating tooth modifications; elimination of flats; designing hobs; cutting speeds; hob sharpening hints; checking hobs for lead and contour; use of centering gages; use of trial 'dummies'; effect of hob and machine errors; use of multiple thread hobs; hob tolerances; etc. Copies of the booklet are available on request.

Booklet on Gear-Finishing

A 16-page booklet discussing the various methods of finishing gears has been issued by Michigan Tool Co., 7171 E. McNichols Road, Detroit. Edited for the practical shop man as well as the engineer, the booklet covers both rotary and rack shaving finishing methods, as well as the latest development "Curve-Shaving."

Uses as well as limitations of "Curve-Shaving" are discussed in detail. Included are sketches, etc., of tooth bearings produced by various means, and explanations of the causes of such bearing characteristics. Copies will be mailed on request.

Super Presents New Service

In view of the wide use of Tungsten Carbide tipped tools throughout American industry, the recent announcement by the Super Tool Co., of the inauguration of their new Carbide Tool Salvage Division should arouse interest.

The average user of Carbide Tipped Tools undoubtedly has on hand an assortment of broken, undersize, or obsolete tools, too costly to scrap, but of no use in their present condition.

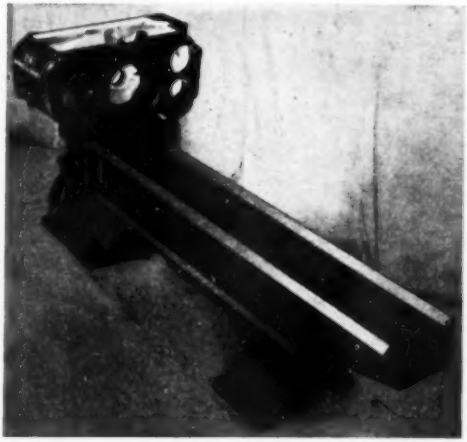
Broken tools can be re-tipped if the shank is fairly good. Tips can be remounted when the shank is beyond repair. Reamers, counterbores, and other round tools as well as gauges, can be expanded and restored to usable size. Obsolete tools can be reground to new shapes or the tips remounted on new shanks.

A bulletin giving full particulars will be sent if you will write to Carbide Tool Salvage Division, Super Tool Co., P. O. Box 68, Harper Sta., Detroit, Mich.

Warner & Swasey Increase Lathe Bed Strength

A new type of construction that is claimed to increase the strength and rigidity of cast iron alloy lathe beds as much as 30% is announced by The Warner & Swasey Co., Cleveland machine tool builders.

Now standard on all but the smallest of the Company's machines, the new construction features diagonal ribbing similar to bridge girder design, instead of conventional box type ribbing. In addition, all the stiffening sections are on the outside walls of the bed. This is said to give greater freedom from twist and vibration, so important today because of the demand for higher speeds and closer limits without subsequent grinding. Also it is easier for chips to clear through the openings and fall into the pan. Greater space for chip clearance, the engineers point out, is of increasing importance as the rate at which metal is removed is increased.



The diagonal ribbing extends into the section below the headstock. This, together with an outer tie member between head and bed, gives considerably increased strength in this region.

The new design is the result of co-operative work by Warner & Swasey's development and research laboratory and its engineering department. The greatly increased rigidity is attained entirely by means of a better distribution of metal. The total weight of the casting is not increased.

A Lightweight Heavy Duty Mall Sander

The Mall Tool Co., 7742 So. Chicago Ave., Chicago, introduces a new heavy duty sander known as the Mallsander. This is a high powered sander that sells at an unusually low price.

It is streamlined, light in weight and perfectly balanced for easy operation with right or left hand. Standard equipment includes 15 ft. of cord and plug, 7" backing pad and abrasive, and a special spindle lock that fastens the spindle when removing or applying the abrasive disc. This eliminates the use of loose wrenches.

It has a high torque, high powered, cool running motor, spiral bevel chrome nickel alloy steel gears and extra strong lightweight housings.

Bearings are dustproof, high grade ball bearings mounted on both shafts.

A large air inlet has been provided for adequate ventilation. It is arranged so that grit and dirt cannot lodge around brush holders, or be deposited on commutator.

Use in confined, close quarters is facilitated by the compact design—only 4" between top of sander and disc.

No load speed is 4200 r.p.m.

Overall length including discs is 16". New weight is 15 lbs.

Putnam Expands Quarters

Providing production facilities necessary to meet the ever increasing demand for Putnam end mills and other lines of cutting tools, the Putnam Tool Co., of Detroit, has recently completed a new plant addition. The new building, fronting on McDougall Avenue, forms an "L" with the building on Charlevoix Avenue in which the company offices are located and where the factory space is now being modernized to provide the best in present-day working conditions.

The new addition, planned to house a portion of the milling and turning department, is modern in every detail. Glass brick has been used along one entire wall. The roof truss construction eliminates all columns, providing a clear expanse of floor space. Walls and ceiling are painted white with a wainscoting of light gray, which, with ample window area and the glass brick, assure excellent lighting during the entire day for every machine.

With this new building, the Company now has adequate space for all present production operations as well as extra floor space which will be utilized as further expansion becomes necessary.

Moline to Make Rockford Units

Final arrangements have been made whereby the Moline Tool Co., Moline, Ill., will take over the manufacturing and sale of the special high-production drilling, boring and tapping machines heretofore manufactured by the Rockford Drilling Machine Division of Borg-Warner Corp., Rockford, Ill. The Moline Tool Co., will build these machines at their plant in Moline, together with their present, well known Hole Hog line of drilling, boring and honing machines.

Erickson Precision Collet Chuck

A new collet - type precision chuck for drills, end - mills, etc. stated to possess unusual grip, also extreme ease and accuracy of set-up, even when broken drills are used, is manufactured by Erickson Steel Co., East 80th St., and Bessemer Ave., Cleveland, Ohio.

The chuck comprises four simple parts—shank, shank grip-nut, collet and nosepiece. All working faces, and the concentricity of holes, bearing and angles, are held to a tolerance of .0001". Collet is inserted in the shank and nosepiece tightened down upon it by means of the shank grip-nut; thus avoiding possibility of twisting the collet. Hexagon on outside of the nose-piece makes set-up easy by permitting two wrenches to be used. The collet is unusually collapsible, and will grip firmly and accurately, drill and end-mill shanks whose diameters differ by as much as 1/32". The construction, moreover, provides an eight-point grip instead of the usual three or four point one, thus giving increased resistance against loosening up. Since the collet grips equally well on flutes or shanks, broken drills or mills are usable without loss of accuracy. The chuck-shank has an unusually deep hole, permitting a drill to be set far enough back to prevent vibration. This, and the eight-point collet grip, minimize breakage-risk even when heavy feeds and high speeds are used. The hardened small diameter nose piece permits working close up to flanges, in grooves, etc., besides giving the operator an unobstructed view. It may also be used as a stop—a useful feature on portable drills and similar equipment.

Chucks and parts may be had separately, or a complete set of Morse taper chucks, with collets from ½" diameter to No. 80 drill size, can be supplied in a substantial lock-box. Brown & Sharpe or Jarno tapers, parallel shank type, etc. can be furnished to special order.

American Cutter Enters Field

The American Cutter & Engineering Co., 1453-15th Street, Detroit, Mich., announces its entry into the field of manufacture of high speed metal cutting tools. The company is equipped to manufacture all types of milling cutters, reamers, counterbores, forming tools, etc. A complete engineering service is available to assist the trade in its cutter problems. Manufacturers' representatives or dealers are solicited.

Officers of the company are as follows: Gerald H. Reader, Pres.; Arlo J. Hillyard, V. P.; Milton Price, Sec'y-Treas. and Weldon C. Elliott is in charge of production.

"Gibsiloy"—A New Contact Point Material

Electrical contacts, claimed to possess the high conductivity of pure silver as well as the low, constant resistance, are now being marketed to manufacturers of electrical equipment under the trade name of "Gibsiloy" by the Gibson Electric Co., 519 Blvd. of the Allies, Pittsburgh, Pa.

Because of its ductility, Gibsiloy—a powdered metal composition—may be formed into a wider variety of shapes than similar materials which, owing to their brittleness, must be cast to form. Moreover, Gibsiloy may be punched, machined, drilled, tapped and otherwise worked as easily as ordinary alloys. Some of the many shapes available, both of solid Gibsiloy and with Gibsiloy attached to base metal backings, are shown in the accompanying illustration.

Gibsiloy contacts are much harder than contacts made of pure silver and resist wear to a far greater degree. Hardnesses range from that of pure silver to 200 Brinell B scale Shore Scleroscope for some grades of silver nickel-tungsten. They are free from galling and their high arc resistance greatly reduces welding or sticking.

The most common forms are silver-nickel-tungsten, silver-nickel-molybdenum, silver-tungsten, and silver-molybdenum. Each form is produced in different grades possessing varying physical properties. Certain forms, particularly silver-nickel-cadmium, greatly reduce transfer of metal from one contact to another on D. C. circuits.

The manufacturer will gladly supply complete information.

All-Angle Tool Distribution

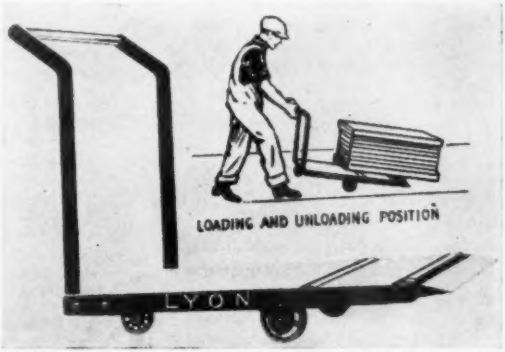
For specialized marketing service required by rapidly increasing sales and production, All-Angle milling machine attachments and All-Angle vises will now be marketed through the Fray Machine & Tool Co., the tool division of Fray-Mershon, Inc., Glendale, Calif. Other lines produced by the Company will be marketed through the Fray-Mershon organization.

L. E. Mershon, general manager of sales for both companies, recently started a nation-wide trip, to call on distributors of the All-Angle milling attachments, and introduce the company's new quill-type machine. The George D. Miller Co., Rockefeller Bldg., Cleveland, Ohio, has been named exclusive distributor in that territory for All-Angle milling attachments.

Lyon Utility Truck Easily Loaded and Unloaded

A handy type of truck has been developed by the Lyon Iron Works, Greene, N. Y. and its utility and usefulness have been tested in many applications.

The present unit has been redesigned and greatly improved in the location of the rollers, the roller bearing type of casters used and is all electric arc welded, with the exception of attachment of the handle which is bolted so as to facilitate shipping.



Due to its low height and tilting features, it is very easy to load and easy to unload. The nose of truck can be pushed under a load easily and the rolls on the platform facilitate loading. To unload, merely tilt truck and the load rolls off.

The truck is particularly adapted for handling baskets or tote boxes of small parts. It is also very handy for moving crates, boxes, machinery and loads that are difficult to handle on other types of hand trucks.

The standard size is furnished with a platform 22" x 32½" (to end of nose 36"). Height of platform is 5", height of handle 30" above floor, made low to enable operator to reach over handle if desired when loading.

It is regularly furnished with two 4" stationary and one 3" swivel casters, all wheels with roller bearings and Alemite lubrication. May be equipped with either semi-steel or rubber tired wheels. Weight of the truck is 100 pounds.

Johnson Friction Clutch Catalog

The Carlyle Johnson Machine Co., Manchester, Conn., announce a new 1939 clutch catalog, 10-pages, size 9¼" x 6¼", descriptive of Johnson Friction Clutches.

It covers the standard type of friction clutch with metal to metal frictions, as well as the Super-Johnson type with Raybestos faced expansion ring, the latter to run dry where such a method of driving is required. All recent improvements are also listed, as well as any changes in prices.

New Respirator Cartridges Conquer Industrial Hazards

Wars in Europe come and go, but warfare waged by scientists against industrial hazards never ceases.

As evidence, announcement is made by American Optical Co., Southbridge, Mass. of the development of three new chemical cartridges which are quickly and easily interchangeable with the standard Type A dust cartridge now being supplied for the American R1000 respirator put on the market last year.

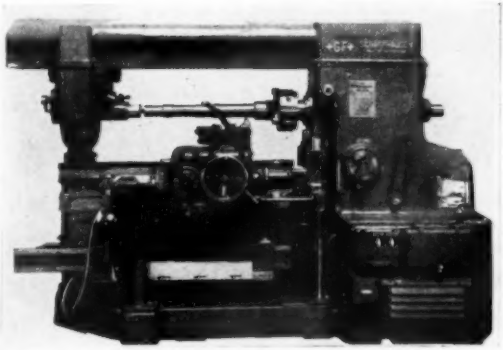
This one unique respirator, therefore, can now be obtained with a range of four protective filters, each providing highly efficient protection against Type A dusts or non-lethal concentrations of certain fumes and vapors.

One of the new chemical cartridges is designed for use against low concentrations of fumes and gases encountered in paint spraying, and other light organic vapors. If desired, a protective cover can be supplied to retard plugging when the respirator is used in paint spraying. The second cartridge can be used against low concentrations of acid gases, and the third against low concentrations of acid organic gases.

All three of the cartridges are alike in construction, differing only in the filtering element. They are long-lived, and thoroughly tested for uniform packing and high efficiency. A specially designed separator on the inlet side permits full use of the entire absorption medium. The wearer breathes easily, and is not subjected to objectionable odor.

Switzerland Offers New Duplicating Lathe

This lathe, built on a new principle, is designed for copying or duplicating medium and heavy workpieces with varying diameters, tapers and contours, i. e. parts of alloy steels such as shafts for gears, machine tools, motors, pumps, fans, etc. The machine is manufactured by the Machine Tool Division of the Fischer Steel Works of Schaffhausen, Switzerland, and sold by W. A. Schuyler, 250 West 57th St., New York City.



The base, column, overarm and outside cylindrical support make a closed, rigid frame, within which the tool holder and workpiece are rigidly held, so that cemented carbide tipped tools can be fully utilized, resulting in large output and accuracy of work.

For duplicating, a templet of mild steel sheet and of the same size and contour as the finished workpiece is attached to the lower part of the lathe. A tracer following the contour of the templet actuates the hydraulic mechanism, which in turn automatically raises or lowers the knee carrying the tool. Thus, the tool has to be set, by the operator by means of the handwheel, only for one diameter of the first workpiece; the other diameters or contours being set automatically by the templet and tracer.

Another unusual feature is that the tool, mounted in a turret head, is placed directly below the work, and its top side

faces to the rear. The spindle and work-piece turn in opposite direction to that in the conventional lathe, so the chips fall to the rear over the sloping rear side of the knee.

The largest diameter that can be turned is 12 in., and the swing diameter is 19 in., with maximum length of 40 in. between centers. The work spindle has 8 speeds, ranging from 70-1200 r.p.m. and the 16 longitudinal feeds range from 3/16-20 in. per min. The spindle is driven, through V-belts and ground gears, by an 18 h. p. motor, and the pump by a 3 h. p. motor. The overall length of the lathe is 8 ft. 4 in., width 4 ft. 8 in., and height 5 ft. 8 in.

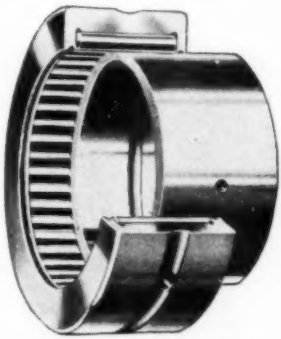
Fafnir Ball Bearing Lineshaft Boxes

A new life-size 8-page folder issued by The Fafnir Bearing Co., New Britain, Conn., shows and describes their entire line of ball bearing lineshaft boxes. These embody as an exclusive feature Fafnir wide inner ring ball bearings with self-locking collars, which permit installation as a unit as supplied, without internal adjustments.

The folder explains the benefits to be derived from the replacement of plain bearing boxes with ball bearing ones. Complete details and specifications are given on all types of Fafnir hanger boxes, as well as general information on lineshaft construction which will be found helpful. Tables provide spacing data for mounting hanger boxes with couplings, standard keyseats for shafts, horsepower of shafting and belting, and suggestions for lubrication.

McGill "Solidend" Multiroll

McGill Mfg., Co., 1500 N. Lafayette St., Valparaiso, Ind., announces a design of full type needle roller bearing, to be known as the "Solidend" Multiroll, which is said to assure an increase in load-carrying capacity of as much as 12% over previous designs.



"Solidend" is intended to be descriptive of the new outer race construction, by which rollers are held integral without the use of end washers and retaining end rings. Roller retaining shoulders are built integral with the outer race so that the possibility of accidentally bending or breaking the conventional end washers, resulting in dissembling the unit, is eliminated.

Extra load-carrying capacity is provided by using full length rounded end rollers instead of the usual trunnion or conical ends, thereby increasing effective race and roller contact. A variety of size combinations that can be used with or without the separable inner races in shaft sizes up to 5 in. facilitates the application of the bearings. Special and larger sizes can be worked out with the help of the McGill engineering department.

Whistler Perforating Dies

A most obvious feature of Whistler Universal Perforating Dies is their adjustability to new requirements—without additional die costs. All parts are interchangeable. When a change in a stamping—or a newly designed stamping—is required, the perforating or notching units can be quickly reassembled for the new operation. Whistler Universal Perforating Dies are adaptable to any type of press and to any thickness of flat sheets up to 1/8". It is asserted that these die assemblies greatly reduce die costs, especially on stampings produced on a limited production basis. Also they are ideal equipment for work where frequent or occasional die changes are required. Detailed information will be supplied on request. A new catalog, containing valuable technical data, and charts, will be sent to responsible firms. In writing, please state type of work, press, etc. Address S. B. Whistler & Sons, Inc., 744 Military Rd., Buffalo, N. Y.

Carboloy Features Wear Resistant Applications at Metal Show

Supplementing a display of the more commonly known uses of Carboloy cemented carbide for cutting tools, drawing and sizing dies, and diamond-impregnated wheel dressers, Carboloy Co., Inc., in their booth at the National

Metal Exposition, Chicago, featured a special exhibit showing the diversified use of Carboloy as a wear-resistant insert on machines and parts subject to rapid abrasive wear.

One striking application was in connection with an Hydraulic (Rodless) Oil Well Pump. The use of Carboloy in this particular case is in the form of balls and inserts to resist wear on the ball valves and seats through which crude oil, usually mixed with sand and water, is pumped. Prior to the adoption of Carboloy, it is said that this type of pump was impractical due to the rapid abrasive wear on valves made of ordinary metals.

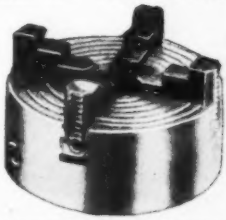
Air CYLINDERS *and* VALVES

We've been making them for our own machines for 25 years. Exclusive design—without tie-rods. More compact! Heads removable without disassembling entire unit. All cylinders cast iron, machined and honed. All diameters, lengths and mountings. Hand valves; foot pedal valves; electric operated valves and our own exclusive design automatic self-operating valves. ***May we quote you on your requirements?***

The Bell Machine Co. 61 Jackson Dr., Oshkosh, Wis.

COMBINATION CHUCKS
WITH THREE and FOUR JAWS

SIZES
4½"
5½"
6½"
7½"
8½"
10½"
12"

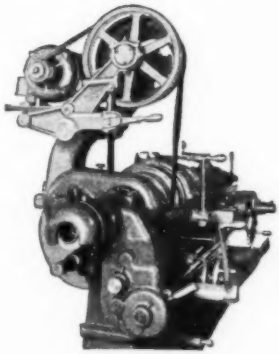


EXACTA Combination Chucks are self-centering and independent. Jaws are reversible for external and internal work. A good investment for shops where short runs and variety of work do not justify frequent changes of chucks.

Write today for price list showing also SELF-CENTERING SCROLL and INDEPENDENT chucks. Whether you require lathe chucks now or in the future it will pay you to COMPARE our prices.

GEORGE SCHERR CO., Inc.
122 Lafayette St., New York, N. Y.

MOTORIZE WITH THE NEWER "TORQ DRIVE"



WRITE FOR LITERATURE TODAY

"the drive with all the features"

- **Variable Belt Tensioner Gives Instant Adjustment In Any Degree.**
- **All Steel Welded Column.**
- **Neat Appearance.**
- **Self Aligning Ball Bearing Housings.**
- **Rigid and Vibrationless.**
- **All Parts Interchangeable.**
- **Easily Installed—(Only 4 Bolts.)**

Torq drives have proven their value in industry—showing substantial gains in production—decreases in power bills—and resultant increases in profit—Torq drives are available in sizes from 1-10 HP for Lathes, Screw Machines, Milling Machines, Shapers, Drills, Punch Presses, and other standard machinery.

THE TORQ ELECTRIC MFG. CO., 6606 Carnegie Ave., CLEVELAND, OHIO

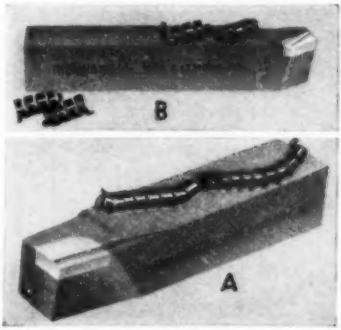
Kennametal Tool Forms

The McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa., announces two new forms of standard Kennametal single point turning, facing, and boring tools for machining steel either annealed, as forged, as cast, or in the heat-treated form up to 550 Brinell. These designs overcome the problem of convenient chip disposal in cutting steel at the highest speeds practical with Kennametal tools.

Figure A shows the parallel chip breaker form, designated as a chip curler, on a standard Style No. 11 right hand turning tool.

Figure B shows the chip breaker ground at an angle, usually 20° to 40° from the side cutting edge, which breaks the chips even of tough nickel steels by deflecting them against the unturned shoulder of the work, where they are snapped off into crescent shaped chips easily shoveled up. This is designated as a chip breaker form.

These chip breaker forms of Kennametal tools are particularly useful in shaft turning work, steel roll and projectile turning jobs, and in general where large volumes of chips are produced per minute.



These tools with chip breaker forms are preferably re-ground in a fixture with diamond impregnated bakelite wheels, or they may be ground by hand with special loose bond silicon-carbide grinding wheels, to maintain this simple chip breaker form. The tools are asserted to cut at speeds three to six times as great as tools of high speed steel. The smooth, non-galling cutting action of Kennametal creating a minimum of "built up edge", even with low tool rake, results in easy machining of steel. Under ordinarily good conditions of machine rigidity, Kennametal tools of these designs will rough and finish in one operation.

MARSCHKE

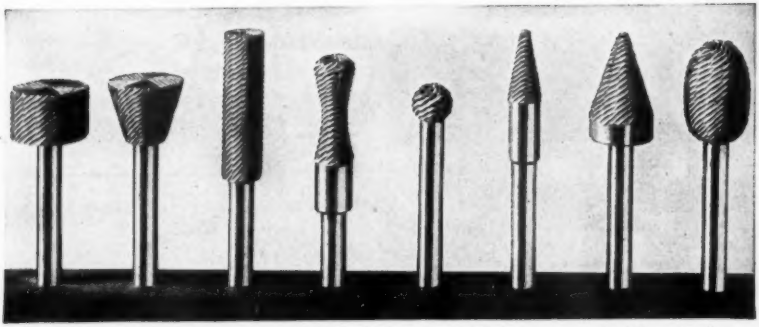
The SELECTIVE SPEED BUFFER with independent spindle drive, as shown in this illustration, is made in three sizes for 5, 7½ and 10 H. P. motors. It is only one of the several types and sizes of MARSCHKE BUFFERS.

The MARSCHKE LINE includes a wide variety of BUFFERS, FLOOR STAND AND SWING FRAME GRINDERS for the different conditions and different requirements of every plant in any industry.

Send for catalog showing machines with 10" to 30" wheels and 1 to 25 H. P. motors

VONNEGUT MOULDER CORP.
1805 Madison Ave.
INDIANAPOLIS, IND.

Ford Hand Cut Rotary Files



Just a few of the many standard shapes which are carried in stock

Send for catalog and full information

413 PERSHING AVE., M. A. FORD MFG. CO. DAVENPORT, IOWA

De Bothezat Announces a New Fan Catalog

More than 200 of these axial flow pressure fans, ranging in size from eight inches to 10 feet, are included in a new illustrated 24 page catalog just issued by the De Bothezat Ventilating Equipment Division of American Machine and Metals, Inc. Copies of the catalog and price lists may be obtained by writing to De Bothezat at East Moline, Illinois.

Grob Prepares for Export Trade

To give the necessary attention to the ever increasing demand from foreign countries for Grob equipment, Grob Brothers, Grafton, Wis., announce the appointment of J. Hall Burton as Director of Exports.

The addition of Mr. Burton to the staff should serve to give wider distribution of Grob products, which at present are in use in England, Belgium, Netherlands, Australia and South Africa.

Lima Gear Shift Motor

Here is a new quick change multi-speed drive unit that eliminates belt shifting and provides four speed changes under finger-tip control.

The compact automotive type transmission forms an integral unit with the motor. The sturdy and rigid mounting bracket is easily applied to all types of machine tools. A convenient hand wheel provides for spindle rotation in setting-up.

The steel transmission gears are heat treated and run in an oil bath with special oil seal closures.

Designed for use with 1800, 1200 or 900 r.p.m. motors, the capacity range is from one to 10 h.p. With a 1200 r.p.m. motor the speeds available are:—366, 607 and 1135 r.p.m., with 324 r.p.m. in reverse. A two speed (1200-600 r.p.m.) motor will provide six forward speeds ranging from 188 to 1135 and reverse speeds of 324-162 r.p.m.

A bulletin giving complete details may be had by addressing Lima Armature Works, 440 N. Main St., Lima, Ohio.

New Reamer Offers Advantages

The Evans Flexible Reamer Co., Ravenswood and Wilson Avenues, Chicago, have developed a new reamer which they claim will produce a chrome-like finish without honing; will not chatter; and provides 50 to 80 thousandths expansion range.

The Evans Reamer is made of high speed steel, has left and right spirals, and has extension pilots for line-reaming work. The full bearing surface assures perfect alignment.

According to the manufacturer, for 50 years, mechanics everywhere have been experminenting to get a reamed hole with full bearing surface and no chatter, and a reamer that would not fall in key ways and oil grooves. Some mechanics use a hone to grind off the high spots but have found the loose abrasive remains embedded in soft metals, such as bronze and aluminum. The new Evans reamer, it is asserted, overcomes these difficulties.

An unusual piece of equipment is the Evans 3-speed reaming machine. It utilizes a ¼ h.p. motor of any required electrical characteristics, controlled by a foot operated switch. Equipped with a chuck that will take care of reamers up to 2½" in diameter, it provides operating speeds of 30, 60 and 100 r.p.m.

Several items in the Evans line are especially useful for automotive servicing.

Bearing Data Slide Rule

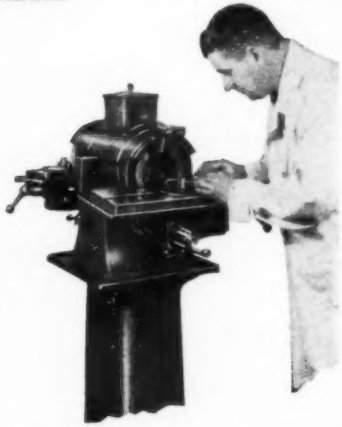
A new slide rule presenting quick reference data on over 800 sizes of standard stock bronze bearings has been prepared by Johnson Bronze Co., New Castle, Pa.

This handy device is intended for engineers, designers and draftsmen who are not permitted or find it inconvenient to keep a copy of a regular bearing catalog on their desks. These rules are being offered free to responsible men. Write on your business letterhead.

Willey's Offers A Larger Carbide Tool Grinder

Answering the demand for a larger Tungsten Carbide Tool Grinder than the No. K-20, Willey's present the K-24, embodying the latest developments for this work.

Standard equipment contemplates a special design of ½ h.p., ball bearing induction type motor, operating at 3450 r.p.m. The shaft is tapered at each end for positive wheel alignment. Thrust collar is provided on one end of motor shaft for end bearing adjustment. Splash lubrication has been supplanted by a gravity feed that saturates a felt retainer pad which is consantly contacting the diamond wheel. Motor control is by a drum type reversible switch. Tool rest tables are of semi-steel, accurately machined, provided with quick clamping features. Table adjustment is 30° from horizontal position.



Spindle height above floor is 43". Floor space required is 40" x 18". Tool rest table is 16" x 7". Net weight is 400 lbs. Diamond holder is ⅜" x 1½". Wheel size with steel back is 8" x 1¼" x 1¼". Rim 2". Diamond wheel is 6" in diameter, ¾" x 1¼" with a ¾" rim. Surface speed of 8" wheel is approxi-

mately 7000 f.p.m., and of 6" diamond wheel, 5000 f.p.m. Standard equipment of dresser includes two 8" vitrified silicon carbide wheels, protractor and diamond dresser.

For further details, please address Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit, Mich.

Cleveland Punch Expands

Contracts for the construction of a 34,000 square foot addition for the Cleveland Punch & Shear Works Co., at 3917 St. Clair Avenue, Cleveland, have been awarded to The Austin Co., engineers and builders.

Steadily increasing activity in domestic markets has made the improvement necessary, according to W. D. Sayle, President of the Company. He stated that the project would represent an investment of approximately $250,000 for the plant and equipment. The addition will accommodate machinery required in the manufacture of larger presses.

Berkeley Rounds-Out Drive Line

The Berkeley line of machine tool drives has been extended to cover a wider range of applications by a recent addition. The new drive embodies a quick-change multi-speed transmission. With this new gear box, the speed ratio may be changed instantly by shifting a single speed change lever.

The illustration shows the new drive applied to a shaper. It can be attached just as easily to lathes, milling machines, presses and other machine tools, requiring from ½ to five h.p., motors

The regular unit provides three speed ratios. A four speed transmission is also available and additional speed ratios may be had through the use of multi-speed motors.

The transmission unit is sturdy, silent and dependable. The gears are hardened and run in oil. Pulley shafts are ball bearing mounted.

The Berkeley line also includes the familiar V-belt and V-belt-helical gear combinations, featuring the "Tension-Tool" for quick adjustment of belt tension.

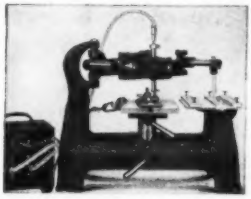
Another recent Berkeley innovation was the P. O. S. (Positive Optional Speed) drive. This model incorporates an infinitely variable speed ratio, obtained by means of an expanding-contracting pulley. This provides speed variations in micro-increments over a three to one range, controlled by a convenient hand wheel.

Bulletins describing all of the different models may be had by addressing Berkeley Engineering Co., 1381 E. 17th St., Cleveland, Ohio.

Preis Combined Engraver and Electrical Marker

A new bench type machine for general engraving work on all materials, and electric etching on soft or hardened steel, has been introduced by H. P. Preis Engraving Machine Co., 155 Summit Street, Newark, N. J. Separate heads, quickly interchangeable, are used for the two classes of work. The machine is shown with electric etching head in place, and the transformer which provides voltage control for light, medium and heavy etching.

On engraving work, depth of cut is controlled, independent of the depth of the master characters, by a micrometer adjustment mechanism on the engraving head. Movement of the engraving cutter to and away from the work is controlled by a cam-action drop lever, thus eliminating the necessity of raising and lowering the pantograph. For engraving on uneven surfaces, or on objects varying in thickness, an automatic depth-of-cut regulator is furnished. It is said that either raised or sunk engraving can be produced, and work on slightly concave or convex surfaces is handled as readily as on flat surfaces.



The compactness of this unit, and the fact that it can be plugged into any light socket, are features which should recommend it for a wide range of industrial and commercial work. An illustrated folder is available on request.

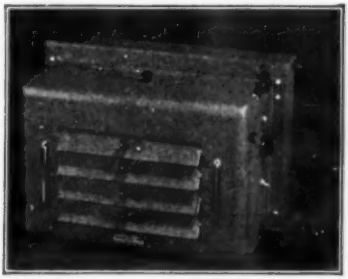
Ward Machinery Catalog

Catalog No. 39 has just been issued by the Ward Machinery Co., 564 W. Washington Blvd., Chicago. This 64-page, profusely illustrated catalog describes machines, tools, and supplies for fabricating sheet metal.

Ad-Lee Window Ventilators

Elimination of draft, removal of 92% of all dust and pollen, dissipation of smoke and odors, subduing of outside noises and providing air circulation under rain, snow, sleet and "dead" air conditions—these are some of the attractive claims for the Ad-Lee Health Air Window Ventilator.

Complete in itself, portable, inexpensive to buy and operate, the unit can be fitted to any window and is furnished to operate from any a.c. or d.c. outlet.



Providing pure, filtered air circulation, under complete control, these units are said to prove a worthwhile investment from the standpoint of employee's health, reducing or eliminating colds and consequent lost time.

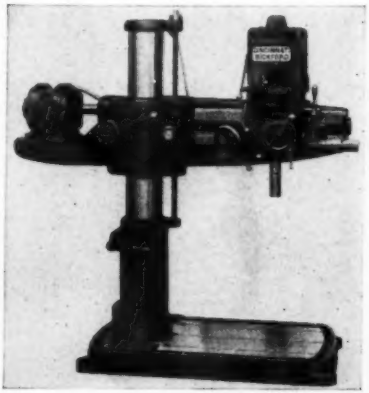
Standard finishes are battleship grey and mahogany brown. Special finishes may be had at a slight extra charge.

Full details may be had by addressing The Ad-Lee Co., Inc., 825 So. Wabash Ave., Chicago, Ill.

A Super- Service Radial By Cincinnati Bickford

Developed especially for applications using small drills and taps in fairly large parts, this new 2½ ft. high speed radial can be equipped with automatic tapping control.

With a constant speed motor, three changes of spindle speed are provided by the geared head. Six speeds may be had through use of a two-speed motor. Control of the latter is provided by a fast-slow-stop switch at right side of head.



Setting the direct reading lever at center of head, three rates of power feed are available, viz., 0.003", 0.006" and 0.009" per revolution of spindle. Power feed is engaged by the quick return levers directly over spindle.

Thrust and radial loads on spindle are absorbed by precision anti-friction bearings. Feed rack is an integral part of spindle sleeve. Both spindle and sleeve are counterweighted.

Power elevation of the arm is standard, with top and bottom supports for elevating screw.

Spindle control lever for forward-stop-reverse is at lower left of head. This operates built-in push buttons controlling the 1 h.p. reversing motor.

Full details may be obtained by addressing The Cincinnati Bickford Tool Co., Oakley, Cincinnati, O.

Buyers' Directory

Abrasive Cut-off Machines
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Tannewitz Works, Grand Rapids, Mich.

Adapters, Adjustable
Glenzer Company, J. C., Detroit, Mich.

Air Filtering Machines
Lincoln Electric Co., Cleveland, Ohio

Alloys, Low Melting
Cerro de Pasco Copper Corp., 44 Wall St., N. Y.

Angle Plates
McMahon Co., Frank, Dayton, Ohio

Arbors
Kearney & Trecker Corp., Milwaukee, Wis.

Balancing Ways
Anderson Bros. Mfg. Co., Rockford, Ill.
Sundstrand Machine Tool Co., Rockford, Ill.

Baling Presses
Galland-Henning Mfg. Co., Milwaukee, Wis.

Ball Bearings, Miniature
Landis & Gyr, Inc., 104 5th Ave., N. Y. C.

Band Saw Machines, for Metal
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago, Ill.
Delta Mfg. Co., Milwaukee, Wis.
Grob Brothers, Grafton, Wis.
Kalamazoo T. & S. Co., Kalamazoo, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Tannewitz Works, Grand Rapids, Mich.
Wells Mfg. Co., Three Rivers, Mich.

Bar Cutters
Buffalo Forge Company, Buffalo, N. Y.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Bearings
Chicago Die Cast. Mfg. Co., 2502 W. Monroe, Chgo.

Belt Sanders
Skilsaw, Inc., 3304 Elston Ave., Chicago, Ill.

Belts, V-Type
Delta Mfg. Co., Milwaukee, Wis.

Bench Legs, Steel
Standard Pressed Steel Co., Jenkintown, Pa.

Bending Machines, Hand and Power
Bath & Co., Cyril, Cleveland, Ohio
Buffalo Forge Company, Buffalo, N. Y.
Lewthwaite Machine Co., 311 E. 47th St., New York, N. Y.

Bending Rolls
Buffalo Forge Co., Buffalo, N. Y.
Marshalltown Mfg. Co., Marshalltown, Ia.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Bins
Stackbin Corp., Providence, R. I.

Bits, Tool, Hand and High Speed
Vincent Steel Process Co., Detroit, Mich.

Blow Torch, Pumpless
National Safety Device Co., 836 Hubbard, Chgo.

Blowers, Portable Electric
Breuer Electric Mfg. Co., 5108 N. Ravenswood Ave., Chicago
Buffalo Forge Co., Buffalo, N. Y.
Clements Mfg. Co., 6650 Naragansett, Chicago
General Blower Co., 401 N. Peoria St., Chicago
Skilsaw, Inc., 3304 Elston Ave., Chicago, Ill.

Bolts and Nuts
Triplex Screw Co., Cleveland, Ohio

Books, Engineering and Technical
Starrett Co., L. S., Athol, Mass.

Boring Bars
Chi. Tool & Eng. Co., 8400 So. Chi. Ave., Chgo.

Boring Heads
Flynn Manufacturing Co., Detroit, Mich.

Brakes, Hand and Power
Dreis & Krump Mfg. Co., 7440 S. Loomis Blvd., Chicago, Ill.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.
Verson Allsteel Press Co., 9303 S. Kenwood, Chgo.

Brazers, Electric
Oliver Machinery Co., Grand Rapids, Mich.

Broaches, Spline and Square
Colonial Broach Co., Detroit, Mich.
Illinois Tool Works, 2501 N. Keeler, Chicago

Broaching Machine Tools
Colonial Broach Co., Detroit, Mich.

Broach Sharpening Machines
Colonial Broach Co., Detroit, Mich.

Buffers, Bench
Cincinnati Electrical Tool Co., Cincinnati, O.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Vonnegut Moulder Corp., Indianapolis, Ind.

Buffers, Pedestal
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Vonnegut Moulder Corp., Indianapolis, Ind.

Bulldozers
Beatty Mch. & Mfg. Co., Hammond, Ind.

Bushings, Jig
Acme Industrial Co., 210 N. Laflin St., Chicago
Colonial Broach Co., Detroit, Mich.

Bushings, Steel
Acme Industrial Co., 210 N. Laflin St., Chicago
Baumbach Mfg. Co., E. A., 1812 So. Kilbourne Ave., Chicago, Ill.
Universal Engineering Co., Frankenmuth, Mich.

Calipers
Comet Tools, Inc., 39 Union Sq., N. Y. C.
Scherr Co., Geo., 122 Lafayette, N. Y. C.

Cams, Alloy Steel
Modern Collet & Machine Co., Ecorse, Mich.

Cap Screws
Triplex Screw Co., Cleveland, Ohio

Carbide Tool Salvage
Super Tool Co., Detroit, Mich.

Centering Machines
Cullman Wheel Co., 1359 Altgeld St., Chicago
Sundstrand Machine Tool Co., Rockford, Ill.

Centers, Lathe
Modern Machine Corp., Brooklyn, N. Y.
Motor Tool Mfg. Co., Detroit, Mich.
Nielsen, Inc., Lawton, Mich.
Rigid Tool Holder Co., Detroit, Mich.
Victor Mchy. Exch., 251 Centre, N. Y. C.

Chains, Silent and Roller
Chicago Gear Works, 440 N. Oakley, Chicago
Cullman Wheel Co., 1359 Altgeld St., Chicag

Chamfering Machines, Automatic
Grant Mfg. & Machine Co., Bridgeport, Conn.

Chrome Plating, Hard
Master Chrome Service, Cleveland, Ohio

Chucking Fingers
Modern Collet & Machine Co., Ecorse, Mich.
Morrison Machine Products Div., Elmira, N. Y

Chucks, Air
Logansport Machine, Inc., Logansport, Ind.
Tomkins-Johnson Co., Jackson, Mich.

Chucks, Automatic
Procunier Safety Chuck Co., 14 S. Clinton St. Chicago, Ill.

Chucks, Collet
Erickson Steel Co., Cleveland, Ohio
Hardinge Brothers, Inc., Elmira, N. Y.
Procunier Safety Chuck Co., 14 St. Clinton St. Chicago, Ill.
Universal Eng. Co., Frankenmuth, Mich.

Chucks, Drill and Tap
Chi. Tool & Eng. Co., 8400 So. Chi. Ave., Chgo.
Errington Mech. Labor., Staten Island, N. Y.
Ettco Tool Co., 594 Johnson Ave., Brooklyn, N. Y
Hartford Special Mach'y Co., Hartford, Conn.
Nielsen, Inc., Lawton, Mich.
Procunier Safety Chuck Co., 14 S. Clinton St. Chicago, Ill.
Scully-Jones & Co., 1905 S. Rockwell St., Chicago, Ill.
Victor Mchy. Exch., 251 Centre, N. Y. C.

Chucks, Drill, Keyless
Motor Tool Mfg. Co., Detroit, Mich.

Chucks, Drill, for Screw Machines
Motor Tool Mfg. Co., Detroit, Mich.

Chucks, Lathe
L-W Chuck Co., Toledo, Ohio

Chucks, Magnetic
Brown & Sharpe Mfg. Co., Providence, R. I.

Chucks, Positive Drive
Apex Mch. & Tool Co., Dayton, Ohio

Chucks, Quick Change
Apex Mch. & Tool Co., Dayton, Ohio
Glenzer Company, J. C., Detroit, Mich.
Procunier Safety Chuck Co., 14 So. Clinton St., Chicago, Ill.

Chucks, Safety Tapping
Apex Mch. Tool Co., Dayton, Ohio

Chucks, Vertical Float
Apex Mch. Tool Co., Dayton, Ohio

Buyers' Directory

Clamps
Hercules Products, San Francisco, Calif.

Clamps, Toggle, Univ. Action
Knu-Vise Inc., Detroit, Mich.

Clutches, Friction
Conway Clutch Co., Cincinnati, Ohio

Coil Winding Equipment
Ideal Commutator Dresser Co., Sycamore, Ill.

Collets and Feed Fingers
Modern Collet & Machine Co., Ecorse, Mich.
Morrison Machine Products Div., Elmira, N. Y.
Sutton Tool Co., Detroit, Mich.

Collets for all Lathes and Millers
Hardinge Brothers, Inc., Elmira, N. Y.
Modern Collet & Machine Co., Ecorse, Mich.
Sutton Tool Co., Detroit, Mich.

Collet Tubes
Modern Collet & Machine Co., Ecorse, Mich.
Sutton Tool Co., Detroit, Mich.

Comparators
Federal Products Corp., Providence, R. I.

Compressors, Air
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.

Contract Work Wanted
Beatty Mch. & Mfg. Co., Hammond, Ind.
Burke Machine Tool Co., Conneaut, Ohio

Coping Machines
Beatty Mch. & Mfg. Co., Hammond, Ind.

Counterbores
Glenzer Company, J. C., Detroit, Mich.
Scully-Jones & Co., 1905 S. Rockwell St., Chicago, Ill.
Threadwell Tap & Die Co., Greenfield, Mass.

Counters
Durant Mfg. Co., Milwaukee, Wis.

Countersinks
Glenzer Company, J. C., Detroit, Mich.
Severance Tool Mfg. Co., Saginaw, Mich.

Couplings, Belt
Armstrong-Bray & Co., 308 N. Loomis, Chicago
Nicholson Co., W. H., Wilkesbarre, Pa.

Couplings, Flexible
Chi. Die Cast. Mfg. Co., 2502 W. Monroe, Chgo.

Couplings, Friction Clutch
Conway Clutch Co., Cincinnati, Ohio

Cranes
Shaw-Box Crane & Hoist Co., 435 Broadway, Muskegon, Mich.

Cut-off Machines
Cincinnati Electrical Tool Co., Cincinnati, Ohio

Cut-off Saws
Oliver Machinery Co., Grand Rapids, Mich.
Tannewitz Works, Grand Rapids, Mich.

Cutter Grinders
Gorton Machine Co., Geo., Racine, Wis.
Oliver Instrument Co., Adrian, Mich.

Cutters
Progressive Tool & Cutter Co., Ferndale, Mich.
Quality Tool Works, Waukegan, Ill.
Tomkins-Johnson Co., Jackson, Mich.

Cutters, Keyway
Threadwell Tap & Die Co., Greenfield, Mass

Cutters, Midget Milling
Ford Mfg. Co., M. A., Davenport, Iowa
Severance Tool Mfg. Co., Saginaw, Mich.

Cutters, Milling
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastern Cutter Salvage Corp., Newark, N. J.
Illinois Tool Works, 2501 N. Keeler, Chicago
Master Tool Co., Cleveland, Ohio
Reisinger Mfg. Co., Rochester, N. Y.
Renu Tool Company, Detroit, Mich.
Scully-Jones & Co., 1905 S. Rockwell St., Chicago, Ill.

Cutters, Gear
Michigan Tool Co., Detroit, Mich.

Cutters, Taper Reaming
Ford Mfg. Co., M. A., Davenport, Iowa
Severance Tool Mfg. Co., Saginaw, Mich.

Cutters, Tube Burring
Ford Mfg. Co., M. A., Davenport, Iowa
Severance Tool Mfg. Co., Saginaw, Mich.

Cutters, Woodruff
Glenzer Company, J. C., Detroit, Mich.

Cutters and Tools, Cutting
Carboloy Co., Detroit, Mich.

Cutting and Notching Mchs.—Angle Iron
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Cylinders, Air
Bell Machine Co., Oshkosh, Wis.
Galland-Henning Mfg. Co., Milwaukee, Wis.
Hanna Engineering Works, 1763 Elston, Chicago
Logansport Machine, Inc., Logansport, Ind.
Tomkins-Johnson Co., Jackson, Mich.

Demagnetizers
Electro-Matic Products Co., 4036 N. Kolmar, Chgo.
Luma Electric Equipment Co., Toledo, Ohio
L-W Chuck Co., Toledo, Ohio
Printz Electric Co., Detroit, Mich.
Victor Machinery Co., 130 S. Clinton St., Chicago, Ill.

Diamonds
Industrial Diamond Co., Detroit, Mich.

Diamond Dressings
Industrial Diamond Co., Detroit, Mich.

Diamond Pointed Tools
Industrial Diamond Co., Detroit, Mich.

Dies
Circle Tip Tool Corp., East Orange, N. J.
Threadwell Tap & Die Co., Greenfield, Mass.

Die Castings
Chi. Die Cast. Mfg. Co., 2502 W. Monroe, Chgo.

Die Duplicating Machines
Gorton Machine Co., Geo., Racine, Wis.

Die Filers
Continental Machine Specialties, Minneapolis
Grob Brothers, Grafton, Wis.
Oliver Instrument Co., Adrian, Mich.
Postel Filing Mch. Co., Minneapolis, Minn.

Die Making Machines
Continental Machine Specialties, Minneapolis
Grob Brothers, Grafton, Wis.
Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney, Hartford, Conn.

Die Makers' Supplies
Cerro de Pasco Copper Corp., 44 Wall St., New York, N. Y.
Dayton Rogers Mfg. Co., Minneapolis, Minn.

Die Sets
Baumbach Mfg. Co., E. A., 1812 S. Kilbourne Ave., Chicago, Ill.
Danly Mch. Specialties, 2130 So. 52nd, Chgo.

Dies, Blank and Forming
American Tool Works, Inc., Hartford, Conn.
Hamilton Tool Company, Hamilton, Ohio
Quality Hdwe. & Mch. Co., 5943 Ravenswood, Chicago

Dies, Perforating
Whistler & Sons, S. B., Buffalo, N. Y.

Dividing Heads
Wm. Carroll & Son, Norwoood, Cincinnati, O.
L-W Chuck Co., Toledo, Ohio

Dowel Pins, Steel
Acme Industrial Co., 210 N. Laflin St., Chicago
Baumbach Mfg. Co., E. A., 1812 S. Kilbourne Ave., Chicago, Ill.

Drawing Instruments
Wade Instrument Co., Cleveland, Ohio.

Dressers, Angle
Vinco Tool Co., Detroit, Mich.

Dressers, Contour Grinding
Brickner-Kropf Mch. Co., Muskegon Heights, Mich.

Dressers, Emery Wheel
Carboloy Co., Detroit, Mich.
M & S Dresser, Hartford, Conn.

Dressers, Grinding Wheel
Desmond-Stephan Mfg. Co., Urbana, Ohio
Vincent Steel Process Co., Detroit, Mich.

Dressers, Radius
Vinco Tool Co., Detroit, Mich.

Drill Bushings
Acme Industrial Co., 210 N. Laflin St., Chicago
Universal Eng. Co., Frankenmuth, Mich.

Drill Jigs, Spec. & Univ.
Heuser Mfg. Co., 1638 N. Paulina St., Chicago

Drills, Core
Glenzer Company, J. C., Detroit, Mich.

Buyers' Directory

Drills, Electric
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Master Tool Co., Cleveland, Ohio
Skilsaw, Inc., 3304 Elston Ave., Chicago, Ill.
Speedway Mfg. Co., 1822 S. 52nd, Cicero, Ill.
Stanley Electric Tool Div., New Britain, Conn.

Drills, Pneumatic
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.

Drills, Taper Shank
Victor Mchy. Exch., 251 Centre, N. Y. C.

Drill Grinders
Black Diamond Saw & Machine Works, Inc., Natick, Mass.
Gallmeyer & Livingston Co., Gr. Rapids, Mich.
Oliver Instrument Co., Adrian, Mich.
Sellers & Co., Wm., Philadelphia, Pa.
Star Electric Motor Co., Bloomfield, N. J.

Drill Presses
Walker-Turner Company, Plainfield, N. J.

Drill Press Heads
Walker-Turner Company, Plainfield, N. J.

Drilling Attachments, High Speed
Dalrae Tools Co., Syracuse, N. Y.

Drilling Machines, Bench
Ames Co., B. C., Waltham, Mass.
Ayer Mfg. Co., F. H., Chicago Heights, Ill.
Atlas Press Co., Kalamazoo, Mich.
Buffalo Forge Company, Buffalo, N. Y.
Burke Machine Tool Co., Conneaut, Ohio
Delta Mfg. Co., Milwaukee, Wis.

Drilling Machines, Multiple Spindle
Buffalo Forge Company, Buffalo, N. Y.
Canedy-Otto Mfg. Co., Chicago Heights, Ill.

Drilling Machines, Portable Electric
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Skilsaw, Inc., 3304 Elston Ave., Chicago, Ill.
Speedway Mfg. Co., 1822 S. 52nd Ave., Cicero, Ill.
Strand Co., N. A., 5001 N. Wolcott St., Chicago

Drilling Machines, Post
Buffalo Forge Company, Buffalo, N. Y.

Drilling Machines, Sensitive
Atlas Press Co., Kalamazoo, Mich.
Ayer Mfg. Co., F. H., Chicago Heights, Ill.
Buffalo Forge Company, Buffalo, N. Y.
Burke Machine Tool Co., Conneaut, Ohio
Hamilton Tool Co., Hamilton, Ohio

Drilling Machines, Vertical
Atlas Press Co., Kalamazoo, Mich.
Buffalo Forge Company, Buffalo, N. Y.

Drilling Mchs., Wall Type
Ayer Mfg. Co., F. H., Chicago Heights, Ill.

Drives, Lathe
Berkeley Engineering Co., Cleveland, Ohio
Drive-All Mfg. Co., Detroit, Mich.
Cullman Wheel Co., 1359 Altgeld St., Chicago
Hardinge Brothers, Inc., Elmira, N. Y.
Quality Hdwe. & Mch. Co., 5943 Ravenswood, Chicago
The Torq Electric Mfg. Co., Cleveland, Ohio
Westlof Tool & Mfg. Co., Detroit, Mich.

Drives, Machine Tool
Drive-All Mfg. Co., Detroit, Mich.
The Torq Electric Mfg. Co., Cleveland, Ohio
Westlof Tool & Mfg. Co., Detroit, Mich.

Drives, Punch Press
The Torq Electric Mfg. Co., Cleveland, Ohio

Drives, Shaper
Quality Hdwe. & Mch. Co., 5943 Ravenswood, Chicago
The Torq Electric Mfg. Co., Cleveland, Ohio
Westlof Tool & Mfg. Co., Detroit, Mich.

Drives, Turret Lathes
The Torq Electric Mfg. Co., Cleveland, Ohio

Elevating Tables
Hamilton Tool Company, Hamilton, Ohio
Midwest Tool & Engineer. Co., Dayton, Ohio

Emery Wheel Dressers and Cutters
Western Tool & Mfg. Co., Springfield, Ohio

End Mills
Glenzer Company, J. C., Detroit, Mich.
Master Tool Co., Cleveland, Ohio
Progressive Tool & Cutter Co., Ferndale, Mich.
Renu Tool Company, Detroit, Mich.
Victor Mchy. Exch., 251 Centre, N. Y. C.

Engraving Machines
Gorton Machine Co., Geo., Racine, Wis.
Luma Electric Equipment Co., Toledo, Ohio
Printz Electric Co., Detroit, Mich.

Exhaust Blowers
Buffalo Forge Company, Buffalo, N. Y.

Experimental Work
American Tool Works, Inc., Hartford, Conn.

Extractors, Tap
Walton Co., Hartford, Conn.

Facers, Spot
Circle Tip Tool Corp., East Orange, N. J.
Glenzer Company, J. C., Detroit, Mich.

Feed Fingers for Auto. Screw Machines
Modern Collet & Machine Co., Ecorse, Mich.
Morrison Machine Products Div., Elmira, N. Y.
Sutton Tool Co., Detroit, Mich.

Files
Oliver Instrument Co., Adrian, Mich.
Victor Mchy. Exch., 251 Centre, N. Y. C.

Files, Rotary
Ford Mfg. Co., M. A., Davenport, Iowa
Grobet File Corp. of America, 3 Park Place, New York, N. Y.
Hamilton Tool Company, Hamilton, Ohio
Pratt & Whitney Div., Hartford, Conn.
Severance Tool Mfg. Co., Saginaw, Mich.

Filing Machines
Continental Machine Specialties, Minneapolis
Grob Brothers, Grafton, Wis.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Oliver Instrument Co., Adrian, Mich.

Filing Room Equipment
Wardwell Manufacturing Co., Cleveland, Ohio

Fixtures
Knu-Vise, Inc., Detroit, Mich.

Flexible Shafts and Accessories
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Stow Mfg. Company, Binghamton, N. Y.
Strand & Co., 5001 N. Wolcott, Chicago
Walker-Turner Company, Plainfield, N. J.
Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo.

Flexible Shaft Machinery
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Pratt & Whitney, Hartford, Conn.
Strand & Co., 5001 N. Wolcott, Chicago
Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo.

Floating Holders
Glenzer Company, J. C., Detroit, Mich.

Floating Holders, Parallel Float
Apex Mch. & Tool Co., Dayton, Ohio

Floating Holders, Parallel & Rad.
Apex Mch. & Tool Co., Dayton, Ohio

Flue Lathes
Marshalltown Mfg. Co., Marshalltown, Ia.

Flue Welders
Marshalltown Mfg. Co., Marshalltown, Ia.

Forming Tools
Circle Tip Tool Corp., East Orange, N. J.
Michigan Tool Co., Detroit, Mich.
Morrison Machine Products Div., Elmira, N. Y.

Furniture, Machine Shop
Standard Pressed Steel Co., Jenkintown, Pa.
Western Tool & Mfg. Co., Springfield, Ohio

Gages
Ames Co., B. C., Waltham, Mass.
Federal Products Corp., Providence, R. I.
Hammond Mchy. Builders, Kalamazoo, Mich.
Vinco Tool Co., Detroit, Mich.

Gages, Pin, Plug, Ring and Snap
American Tool Works, Inc., Hartford, Conn.

Gages, Pressure
Marshalltown Mfg. Co., Marshalltown, Ia.

Gages, Spring Stock
Knu-Vise, Inc., Detroit, Mich.

Gages, Taper
Hartford Special Machinery Co., Hartford, Conn.

Buyers' Directory

Gears
Abart Gear & Mche. Co., 4832 W. 16th St., Chgo.
Chicago Gear Works, 440 N. Oakley, Chicago

Generators, Motor
Chicago Elec. Co., 1330 W. Cermak Rd., Chgo.
Lincoln Electric Co., Cleveland, Ohio
Star Electric Motor Co., Bloomfield, N. J.

Grinders, Bench
Baldor Electric Co., St. Louis, Mo.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Stanley Electric Tool Div., New Britain, Conn.
Vonnegut Moulder Corp., Indianapolis, Ind.
Walker-Turner Company, Plainfield, N. J.

Grinders, Disc
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Gaston Power Tools Co., Evergreen Park, Ill.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo.

Grinders, Flexible Shaft
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Stanley Electric Tool Div., New Britain, Conn.
N. A. Strand & Co., 5001 N. Wolcott, Chicago

Grinders, Hand
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Dremel Mfg. Co., Racine, Wis.
Dumore Co., Racine, Wis.
Duro Metal Products Co., 2651 N. Kildare Ave., Chicago, Ill.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Skilsaw, Inc., 3304 Elston Ave., Chicago, Ill.

Grinders, Heavy Duty
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Vonnegut Moulder Corp., Indianapolis, Ind.

Grinders, High Speed
Bridgeport Machines, Inc., Bridgeport, Conn.
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.
Dremel Mfg. Co., Racine, Wis.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.

Grinders, Internal
Chi. Tool & Eng. Co., 8400 So. Chi. Ave., Chgo.

Grinders, Pedestal Electric
Baldor Electric Co., St. Louis, Mo.
Cincinnati Electrical Tool Co., Cincinnati, Ohio

Grinders, Precision
Dumore Co., Racine, Wis.

Grinders, Production Surface
Bergram Mech. Eng. Co., New Britain, Conn.
Gallmeyer & Livingston Co., Gr. Rapids, Mich.

Grinders, Snagging
Cincinnati Electrical Tool Co., Cincinnati, Ohio

Grinders, Surface, Auto. Feed
Gallmeyer & Livingston Co., Gr. Rapids, Mich.
Reid Brothers Co., Beverly, Mass.

Grinders, Swing Frame
Vonnegut Moulder Corp., Indianapolis, Ind.

Grinders, Utility
Bergram Mech. Eng. Co., New Britain, Conn.

Grinders, Univ. Tools & Cutter
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio

Grinding Attachments, Drill
Atlas Press Co., Kalamazoo, Mich.
Carlson Mfg. Co., C. H., Minneapolis, Minn.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Oliver Instrument Co., Adrian, Mich.

Grinding, Centerless (Contract)
Eastern Centerless Grind. Co., Hartford, Conn.
Heim Company, Fairfield, Conn.

Grinding Machines, Belt
Armglo Co., Milwaukee, Wis.
Walls Sales Corp., 96 Warren St., New York

Grinding Machines, Cutter, Reamer and Tool
Brown & Sharpe Mfg. Co., Providence, R. I.
Gallmeyer & Livingston Co., Gr. Rapids, Mich.
Lee & Son, K. O., Aberdeen, S. Dak.
National Machine Tool Co., Racine, Wis.
Oliver Instrument Co., Adrian, Mich.

Grinding Machines, Portable Electric
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Chi. Tool & Eng. Co., 8400 So. Chi. Ave., Chgo.
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.
Dremel Mfg. Co., Racine, Wis.
Duro Metal Products Co., 2651 N. Kildare Ave., Chicago, Ill.
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
National Machine Tool Co., Racine, Wis.
Pratt & Whitney, Hartford, Conn.
Stow Mfg. Company, Binghamton, N. Y.
Strand Co., N. A., 5001 N. Wolcott St., Chicago

Grinding Mchs., Port. Pneumatic
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.

Grinding Wheels
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.

Hack Saw Blades
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago, Ill.
Racine Tool & Mch. Co., Racine, Wis.
Victor Mchy. Exch., 251 Centre, N. Y. C.

Hack Saw Machines
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago, Ill.
L-W Chuck Co., Toledo, Ohio
Racine Tool & Mch. Co., Racine, Wis.

Hammers, Chipping
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Master Tool Co., Cleveland, Ohio

Hammers, Portable Electric
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Stanley Electric Tool Div., New Britain, Conn.

Hammers, Riveting
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.

Hand Saws, Portable Electric
Skilsaw, Inc., 3304 Elston Ave., Chicago, Ill.

Hand Screw Machine Live Centers
Motor Tool Mfg. Co., Detroit, Mich.

Hand Screw Machines, Precision
Hardinge Brothers, Inc., Elmira, N. Y.

Handpieces, Reciprocating
Stow Mfg. Company, Binghamton, N. Y.

Heads, Boring
Flynn Manufacturing Co., Detroit, Mich.

Heat Treating
Vincent Steel Process Co., Detroit, Mich.

Hinges, Continuous Steel
Auto Moulding & Mfg. Co., 2326 S. Canal, Chgo.

Hinges, Plain and Offset
Auto Moulding & Mfg. Co., 2326 S. Canal, Chgo.

Hobs
Illinois Tool Works, 2501 N. Keeler, Chicago
Michigan Tool Co., Detroit, Mich.

Hoists, Chain—Bought and Sold
Logeman, T. V., Normandy (St. Louis Co.), Mo.

Hoists, Chain—Serviced
Logeman, T. V., Normandy (St. Louis Co.), Mo.

Hoists, Electric
Shaw-Box Crane & Hoist Co., 435 Broadway, Muskegon, Mich.

Index Centers
Brown & Sharpe Mfg. Co., Providence, R. I.
Wm. Carroll & Son, Norwood, Cincinnati, Ohio
L-W Chuck Co., Toledo, Ohio

Indicators, Dial
Federal Products Corp., Providence, R. I.

Indicators, Surface Test
Federal Products Corp., Providence, R. I.

Jigs and Fixtures
American Tool Works, Inc., Hartford, Conn.
Hamilton Tool Company, Hamilton, Ohio
Hartford Special Machinery Co., Hartford, Conn.

Joints, Universal
Apex Machine Co., Dayton, Ohio
Borgeson Mfg. Co., Torrington, Conn.

Keyseating Machines
Burr & Son, John T., Brooklyn, N. Y.

Lacings, Belt
Armstrong-Bray & Co., 308 N. Loomis, Chicago

Lathe Live Centers
Modern Machine Corp., Brooklyn, N. Y.
Motor Tool Mfg. Co., Detroit, Mich.

Buyers' Directory

Lathe Drives
Cullman Wheel Co., 1359 Altgeld St., Chicago
Hardinge Brothers, Inc., Elmira, N. Y.

Lathes, Automatic
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio
Lipe, Inc., W. C., Syracuse, N. Y.

Lathes, Back Geared
Atlas Press Co., Kalamazoo, Mich.
Rivett Lathe & Grinder, Inc., Brighton, Boston
South Bend Lathe Works, South Bend, Ind.

Lathes, Bench
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazoo, Mich.
Delta Mfg. Co., Milwaukee, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston
Sheldon Mch. Co., 1629 N. Kilbourn Ave., Chicago
South Bend Lathe Works, South Bend, Ind.
Wade Tool Co., Waltham, Mass.

Lathes, Deep Hole Boring
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio

Lathes, Engine
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio
South Bend Lathe Works, South Bend, Ind.

Lathes, Gap
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio

Lathes, Hollow Spindle
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio

Lathes, Hydraulic
Lipe, Inc., W. C., Syracuse, N. Y.

Lathes, Manufacturing
Sundstrand Machine Tool Co., Rockford, Ill.

Lathes, Multicut
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio

Lathes, Polishing & Buffing
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Hardinge Brothers, Inc., Elmira, N. Y.

Lathes, Precision
South Bend Lathe Works, South Bend, Ind.

Lathes, Precision Bench
Atlas Press Co., Kalamazoo, Mich.
Hardinge Brothers, Inc., Elmira, N. Y.
South Bend Lathe Works, South Bend, Ind.

Lathes, Screw Cutting
Atlas Press Co., Kalamazoo, Mich.
Hardinge Brothers, Inc., Elmira, N. Y.
South Bend Lathe Works, South Bend, Ind
Wade Tool Co., Waltham, Mass.

Lathes, Speed
Schauer Machine Co., Cincinnati, Ohio

Lathes, Toolroom
Atlas Press Co., Kalamazoo, Mich.
Hardinge Brothers, Inc., Elmira, N. Y.
LeBlond Mch. Tool Co., R. K., Cincinnati, Ohio
South Bend Lathe Works, South Bend, Ind.

Layout Tables
Busch Co., J. C., Milwaukee, Wis.

Leaders Pins, Steel
Acme Industrial Co., 210 Laflin St., Chicago, Ill.

Leather Oil Retainers
Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago

Length Standards
Scherr Co., Geo., 122 Lafayette, N. Y. C.

Lights, Elec. Movable
Zagora Mch. & Gear Co., J., Charlotte, N. C.

Lights, Shop
Chi. Die Cast. Mfg. Co., 2502 W. Monroe, Chicago
Vimco Mfg. Co., Buffalo, N. Y.
Zagora Mch. & Gear Co., J., Charlotte, N. C.

Live Lathe Centers
Glenzer Company, J. C., Detroit, Mich.
Modern Machine Corp., Brooklyn, N. Y.
Motor Tool Mfg. Co., Detroit, Mich.

Lubricators, Air
Norgren Co., C. A., Denver, Colorado

Lubricators, Automatic
Norgren Co., C. A., Denver, Colorado

Lubricating Devices
Essex Brass Corp., Detroit, Mich.

Magnetic Chuck Demagnetizers
Electro-Matic Products Co., 4036 N. Kolmar, Chgo.

Mandrels
Lee & Son Co., K. O., Aberdeen, S. Dak.

Mandrels, Expanding
Nicholson Co., W. H., Wilkesbarre, Pa.
Western Tool & Mfg. Co., Springfield, Ohio

Marking Machines
Bates, H. O., Elizabeth, N. J.
Ideal Commutator Dresser Co., Sycamore, Ill.
New Method Steel Stamp, Inc., Detroit, Mich.
Schmidt, Geo. T., Inc., 1802 Belle Plaine Ave. Chicago, Ill.

Meters, Air Velocity
Ill. Testing Lab., 150 W. Austin, Chicago.

Milling Attachments
Bridgeport Machines, Inc., Bridgeport, Conn.
Burke Machine Tool Co., Conneaut, Ohio
Wm. Carroll & Son, Norwood, Cincinnati, Ohio
Dalrae Tools Co., Syracuse, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.

Milling Cutters
Master Tool Co., Cleveland, Ohio
Victor Mchy. Exch., 251 Centre, N. Y. C.

Milling Machine Live Centers
Motor Tool Mfg. Co., Detroit, Mich.

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Hardinge Brothers, Inc., Elmira, N. Y.
Sundstrand Machine Tool Co., Rockford, Ill.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Sundstrand Machine Tool Co., Rockford, Ill.

Milling Machines, Plain
Burke Machine Tool Co., Conneaut, Ohio
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Machine Tool Co., Rockford, Ill.

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorton Machine Co., Geo., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.

Milling Machines, Vertical
Blank & Buxton Mchy. Co., Jackson, Mich.
Gorton Machine Co., Geo., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.

Mills, Hollow
Reisinger Mfg. Co., Rochester, N. Y.

Motors, Electric
Dremel Mfg. Co., Racine, Wis.
Lincoln Electric Co., Cleveland, Ohio
Star Electric Motor Co., Bloomfield, N. J.

Motors, Elec. Internal Brakes
Star Electric Motor Co., Bloomfield, N. J.

Motor Drives, Universal
Berkeley Engineering Co., Cleveland, Ohio
Cullman Wheel Co., 1359 Altgeld St., Chicago
Quality Hdwe. & Mch. Co., 5943 Ravenswood, Chicago
Steege Mchy. Co., W. L., 548 W. Monroe, Chgo.
Turner Uni-Drive Co., Kansas City, Mo.

Motor Units, Worm Gear
Star Electric Motor Co., Bloomfield, N. J.

Moulds & Ladles, Hammer and Vise
Johnson Tool Co., East Providence, R. I.

Multiple Oilers
Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago

Nails
Hassall, Inc., John, Brooklyn, N. Y.

Name Plates
Bates, H. O., Elizabeth, N. J.

Nibbling Machines
Libert Machine Co., Green Bay, Wis.
National Machine Tool Co., Racine, Wis.

Nut Setters
Cincinnati Electrical Tool Co., Cincinnati, Ohio

Oil Cups
Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago

Oil Gauges
Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago

Oil and Grease Seals
Gits Bros. Mfg. Co., 1860 S. Kilbourn, Chicago

Oilers, Automatic
Trico Fuse Mfg. Co., Milwaukee, Wis.

Pins, Leader and Dowel
Acme Industrial Co., 210 N. Laflin St., Chicago
Baumbach Mfg. Co., E. A., 1812 S. Kilbourne Ave., Chicago, Ill.

Pipe Threading Machines
Triplex Machine Co., Pittsfield, Mass.

Pliers, Toggle
Knu-Vise Inc., Detroit, Mich.

Point Thinning Machines
Oliver Instrument Co., Adrian, Mich.

Buyers' Directory

Power Devices, Air-hydraulic
Logansport Machine, Inc., Logansport, Ind.

Press Brakes
Dreis & Krump Mfg. Co., 7440 Loomis Blvd., Chicago, Ill.
Verson Allsteel Press Co., 9303 So. Kenwood, Chi.

Press Feeds
Littell Machine Co., F. J., 4153 Ravenswood Ave., Chicago, Ill.
Rockford Iron Works, Rockford, Ill.
Wittek Mfg. Co., 4309 W. 24th Place, Chicago

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Famco Machine Co., Racine, Wis.
Greenerd Arbor Press Co., Nashua, N. H.
Hanna Engineering Works, 1763 Elston, Chicago
Nicholson Co., W. H., Wilkesbarre, Pa.
Sheldon Mch. Co., 1629 N. Kilbourn, Chicago
Tomkins-Johnson Co., Jackson, Mich.
Wilson, K. R., Buffalo, N. Y.

Presses, Bench
Atlas Press Co., Kalamazoo, Mich.
Famco Machine Co., Racine, Wis.
Greenerd Arbor Press Co., Nashua, N. H.
Loshbough-Jordan Tool & Mch. Co., Elkhart, Ind.
Rockford Iron Works, Rockford, Il..

Presses, Broaching
Greenerd Arbor Press Co., Nashua, N. H.

Presses, Foot
Famco Machine Co., Racine, Wis.
Rockford Iron Works, Rockford, Ill.

Presses, Forming
Marshalltown Mfg. Co., Marshalltown, Ia.

Presses, Hydraulic
Atlas Press Co., Kalamazoo, Mich.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Greenerd Arbor Press Co., Nashua, N. H.

Presses, Inclinable
Federal Press Co., Elkhart, Ind.
Loshbough-Jordan Tool & Mch. Co., Elkhart, Ind.
Marshalltown Mfg. Co., Marshalltown, Ia.
Rockford Iron Works, Rockford, Ill.
Ross Co., David J., Benton Harbor, Mich.

Presses, Power
Dreis & Krump Mfg. Co., 7440 Loomis Blvd., Chicago, Ill.
Federal Press Co., Elkhart, Ind.
Loshbough-Jordan Tool & Mch. Co., Elkhart, Ind.
Rockford Iron Works, Rockford, Ill.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.
Verson Allsteel Press Co., 9303 So. Kenwood, Chi.

Presses, Punch
Dreis & Krump Mfg. Co., 7440 Loomis Blvd., Chicago, Ill.
Lewthwaite Machine Co., 311 E. 47th St., New York, N. Y.
Loshbough-Jordan Tool & Mch. Co., Elkhart, Ind.
Marshalltown Mfg. Co., Marshalltown, Ia.
Rockford Iron Works, Rockford, Ill.
Ross Co., David J., Benton Harbor, Mich.

Presses, Sheet Metal
Federal Press Co., Elkhart, Ind.
Loshbough-Jordan Tool & Mch. Co., Elkhart, Ind.

Profiling Machines
Gorton Machine Co., Geo., Racine, Wis.
Oliver Instrument Co., Adrian, Mich.
Wade Tool Co., Waltham, Mass.

Pulleys, Die Cast
Chi. Die Cast. Mfg. Co., 2502 W. Monroe, Chgo.

Pulleys, Steel and Wood
Delta Mfg. Co., Milwaukee, Wis.

Pumps
Brown & Sharpe Mfg. Co., Providence, R. I.
Galland-Henning Mfg. Co., Milwaukee, Wis.

Pumps, Centrifugal
Logansport Machine, Inc., Logansport, Ind.

Pumps, Coolant
Ruthman Machinery Co., Cincinnati, Ohio
Tomkins-Johnson Co., Jackson, Mich.

Pumps, Lubricant
Ruthman Machinery Co., Cincinnati, Ohio

Punch, Shear and Bender, Hand
Armstrong-Blum Mfg. Co., 5741 Bloomingdal Ave., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.

Punch Press Guards
Ross Co., David J., Benton Harbor, Mich.

Punches and Dies
Lewthwaite Machine Co., 311 E. 47th St., New York, N. Y.

Punches, Hand
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago, Ill.
Buffalo Forge Company, Buffalo, N. Y.
Lewthwaite Machine Co., 311 E. 47th St., New York, N. Y.
Whitney Metal Tool Co., Rockford, Ill.

Punches, Hand and Power
Beatty Mch. & Mfg. Co., Hammond, Ind.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Punches, Piercing
Durable Punch & Die Co., 711 W. Lake, Chicago

Punches, Transfer
McMahon Co., Frank, Dayton, Ohio

Punches and Shears, Comb.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Pyrometers
Ill. Test. Laboratories, 150 W. Austin, Chicago
Pyrometer Instrument Co., 102 Lafayette, N. Y. C.

Pyrometers, Optical
Pyrometer Instrument Co., 102 Lafayette, N. Y. C.

Pyrometers, Portable and Stationary
Pyrometer Instrument Co., 102 Lafayette, N. Y. C.

Racks, Bar Stock
Western Tool & Mfg. Co., Springfield, Ohio
Wm. S. Yohe Supply Co., Canton, Ohio

Reamers
Glenzer Company, J. C., Detroit, Mich.
Master Tool Co., Cleveland, Ohio
Renu Tool Company, Detroit, Mich.

Rivets
Hassall, Inc., John, Brooklyn, N. Y.

Rivets, Tubular and Split
Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

Riveters, Automatic Feed
Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.
Tomkins-Johnson Co., Jackson, Mich.

Riveters, Multiple Spindle
Grant Mfg. & Machine Co., Bridgeport, Conn.

Riveters, Pneumatic
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Hanna Engineering Works, 1763 Elston Ave., Chicago, Ill.

Riveting Machines
Buffalo Forge Company, Buffalo, N. Y.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Hanna Engineering Works, 1763 Elston Ave., Chicago, Ill.

Riveting Machines, Tubular and Split
Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

Rod Cutters
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave, Chicago, Ill.
Lewthwaite Machine Co., 311 E. 47th St., New York, N. Y.

Rotary Tables
Troyke, Alfred A., Cincinnati, Ohio

Sanders
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Stanley Electric Tool Div., New Britain, Conn.
Sterling Products Co., Detroit, Mich.
Stow Mfg. Company, Binghamton, N. Y.

Sanders, Disc
Gaston Power Tools Co., Evergreen Park, Ill.

Saws
Black Diamond Saw & Machine Works, Inc., Natick, Mass.

Saws, Electric Hand
Delta Mfg. Co., Milwaukee, Wis.
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Stanley Electric Tool Div., New Britain, Conn.

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Saws, Metal Cutting
Racine Tool & Mch. Co., Racine, Wis.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Saws, Rotary Hack
Stanley Electric Tool Div., New Britain, Conn.

Saw Sharpening Machines
Wardwell Manufacturing Co., Cleveland, Ohio

Sawing Machines
Continental Machine Specialties, Minneapolis
Delta Mfg. Co., Milwaukee, Wis.
Wells Mfg. Corp., Three Rivers, Mich.

Scraping Machines, Hand & Pneumatic
Anderson Bros. Mfg. Co., Rockford, Ill.

Screw Drivers, Electric
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Haskins Co., R. G., 623 S. California, Chicago
Stanley Electric Tool Div., New Britain, Conn.
Stow Mfg. Company, Binghamton, N. Y.

Screw Drivers, Hand (Phillips)
Apex Mch. & Tool Co., Dayton, Ohio

Screw Driver Bits (Phillips & slotted screws)
Apex Mch. & Tool Co., Dayton, Ohio

Screw Machine Parts
Modern Collet & Machine Co., Ecorse, Mich.
Sutton Tool Company, Detroit, Mich.

Screw Machine Products
Economy Machine Products Co., 5207 Lawrence Ave., Chicago, Ill.

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.

Screwplates
Threadwell Tap & Die Co., Greenfield, Mass.

Screws
Hassall, Inc., John, Brooklyn, N. Y.

Set Screws, Headless and Hollow
Economy Machine Products Co., 5207 Lawrence Chicago, Ill.
Safety Socket Screw Corp., 4440 N. Knox Ave., Chicago, Ill.
Standard Pressed Steel Co., Jenkintown, Pa.
Triplex Screw Co., Cleveland, Ohio

Shafts, Flexible
Haskins Co., R. G., 623 S. California, Chicago
Mall Tool Co., 7742 S. Chicago Ave., Chicago, Ill.
Pratt & Whitney, Hartford, Conn.
Stow Mfg. Company, Binghamton, N. Y.
Strand Co., N. A., 5001 N. Wolcott St., Chicago

Shafts, Hangers & Boxes
Delta Mfg. Co., Milwaukee, Wis.

Shapers
Atlas Press Co., Kalamazoo, Mich.

Shears, Bevel
Marshalltown Mfg. Co., Marshalltown, Ia.

Shears, Hand
Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago, Ill.
Beverly Shear Co., 3007 W. 110th Pl., Chicago
Lewthwaite Machine Co., 311 E. 47th St., New York, N. Y.
National Machine Tool Co., Racine, Wis.
Whitney Metal Tool Co., Rockford, Ill.

Shears, Power
Beatty Mch. & Mfg. Co., Hammond, Ind.
Buffalo Forge Company, Buffalo, N. Y.
Dreis & Krump Mfg. Co., 7440 Loomis, Chicago
Libert Machine Co., Green Bay, Wis.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.
Stanley Electric Tool Div., New Britain, Conn.

Shears, Slitting
Beverly Shear Co., 3007 W. 110th Pl., Chicago
Buffalo Forge Co., Buffalo, N. Y.
Dreis & Krump Mfg. Co., 7440 Loomis Chicago
National Machine Tool Co., Racine, Wis.

Shears, Splitting
Marshalltown Mfg. Co., Marshalltown, Ia.

Shears, Throatless
Beverly Shear Co., 3007 W. 110th Pl., Chicago
Marshalltown Mfg. Co., Marshalltown, Ia.
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Sheet Metal Machinery
Libert Machine Co., Green Bay, Wis.

Sleeves
Glenzer Company, J. C., Detroit, Mich.

Sleeves, Intermeshing
Durable Punch & Die Co., 711 W. Lake, Chicago

Socket Head Cap Screws
Economy Machine Products Co., 5207 Lawrence Ave., Chicago, Ill.
Safety Socket Screw Corp., 4440 N. Knox Ave., Chicago, Ill.
Standard Pressed Steel Co., Jenkintown, Pa.

Spacing Collars
Scully-Jones & Co., 1905 S. Rockwell St., Chicago, Ill.

Special Tools and Machinery
American Tool Works, Inc., Hartford, Conn.
Beatty Mch. & Mfg. Co., Hammond, Ind.
Quality Hdwe. & Mch. Co., 5943 Ravenswood, Chicago

Speed Reducers
Abart Gear & Mchc. Co., 4832 W. 16th St., Chgo.
Chicago Gear Works., 440 N. Oakley, Chicago
Cullman Wheel Co., 1359 Altgeld St., Chicago

Speed Saws, Universal
Wyzenbeek & Staff, Inc., 838 W. Hubbard, Chgo.

Split Rivets
Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

Split Rivet Setters, Automatic Feed
Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

Spools & Nuts for Auto. Screw Machines
Sutton Tool Co., Detroit, Mich.

Spot Welding Machines, Speed
Interstate Machinery Co., Chicago, Ill.

Sprockets
Cullman Wheel Co., 1359 Altgeld St., Chicago

Stake Riveters
Marshalltown Mfg. Co., Marshalltown, Ia.

Stampings
Hamilton Tool Company, Hamilton, Ohio
Southern Products, Independence, Mo.

Stamps, Steel
Bates, H. O., Elizabeth, N. J.
Colonial Broach Co., Detroit, Mich.
New Method Steel Stamp, Inc., Detroit, Mich.

Steel
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Stools, Shop
Standard Pressed Steel Co., Jenkintown, Pa.

Storage Racks
Stackbin Corp., Providence, R. I.
Yohe Supply Co., Canton, Ohio

Straightening Machines
Whitney Metal Tool Co., Rockford, Ill.

Buyers' Directory

Structural Shop Machinery
Ryerson & Son, Jos. T., 16th & Rockwell, Chgo.

Stud Setters
Apex Machine Co., Dayton, Ohio

Studs, Milled
Safety Socket Screw Corp., 4440 N. Knox Ave., Chicago, Ill.

Surfaces, Wearing
Circle Tip Tool Corp., East Orange, N. J.

Tables, Elevating
Midwest Tool & Engineering Co., Dayton, Ohio

Tables, Spacing
Beatty Mch. & Mfg. Co., Hammond, Ind.

Taps
Threadwell Tap & Die Co., Greenfield, Mass.

Tap Extractors
Walton Co., Hartford, Conn.

Tap Holders
Procunier Safety Chuck Co., 14 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1905 S. Rockwell St., Chicago, Ill.

Tappers, Electric Portable
Chi. Pneum. Tool Co., 6 E. 44th, N. Y. C.
Cincinnati Electrical Tool Co., Cincinnati, Ohio

Tapping Jigs, Univ.
Heuser Mfg. Co., 1638 N. Paulina, Chicago

Tapping Machines and Attachments
Burke Machine Tool Co., Conneaut, Ohio
Errington Mechanical Laboratories, Staten Island, N. Y.
Etteo Tool Co., 594 Johnson Ave., Brooklyn, N. Y.
Haskins Co., R. G., 623 S. California, Chicago
Procunier Safety Chuck Co., 14 S. Clinton St., Chicago, Ill.
Whitney Metal Tool Co., Rockford, Ill.

Thermometers, Resistance Type
Ill. Test. Lab., 150 W. Austin, Chicago

Threading Machines, Automatic
Grant Mfg. & Machine Co., Bridgeport, Conn.

Threading Tools
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston

Tool Holders
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago, Ill.
Michigan Tool Co., Detroit, Mich.
Western Tool & Mfg. Co., Springfield, Ohio

Tool Post Grinders
Cincinnati Electrical Tool Co., Cincinnati, Ohio

Tool Post Turrets
Colwell, S. G., Providence, R. I.

Tool Reclaim. & Salvage
Eastern Cutter Salvage Corp., Newark, N. J.
Master Tool Co., Cleveland, Ohio
Renu Tool Company, Detroit, Mich.

Tools, Boring
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago, Ill.
Comet Tools, Inc., 39 Union Sq., N. Y. C.

Tools, Carbide Tipped
Super Tool Co., Detroit, Mich.

Tools, Cutting
Circle Tip Tool Corp., East Orange, N. J.

Tools, Diamond Wheel Dressing
Super Tool Co., Detroit, Mich.

Tools, Lathe and Planer
Armstrong Bros.. Tool Co., 308 N. Francisco Ave., Chicago, Ill.

Tools, Machinists'
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.

Tools, Pneumatic and Main Parts
Eastern Cutter Salvage Corp., Newark, N. J.
Master Tool Co., Cleveland, Ohio

Torch, Pumpless Gasoline
National Safety Device Co., 836 Hubbard. Chicago

Tracing Sheets
Wade Instrument Co., Cleveland, Ohio

Transmissions, Variable Speed
Ideal Commutator Dresser Co., Sycamore, Ill.

Tube Flanging Machines
Grant Mfg. & Mche. Co., Bridgeport, Conn.

Tubular Rivet Setters, Automatic Feed
Chicago Rivet & Machine Co., 1855 S. 54th St., Cicero, P. O. Chicago, Ill.

Tungsten Carbide Tools
Circle Tip Tool Corp., East Orange, N. J.
Michigan Tool Co., Detroit, Mich.
Super Tool Co., Detroit, Mich.

Universal Joints
American Tool Works, Inc., Hartford, Conn.
Chicago Gear Works, 440 N. Oakley, Chicago

Used and Rebuilt Machinery
Aaron Machinery Co., 176 Lafayette St., N. Y.
Acme Equipment Co., 128 S. Clinton, Chicago
Belyea Company, Jersey City, N. J.
Bennet-Rafkin Machine Tool Corp., 30 Church St., New York, N. Y.
Bernstein & Co., Geo. M., 12 S. Clinton, Chgo.
Botwinik Brothers, Inc., New Haven, Conn.
Bradley Mchy. Co., Detroit, Mich.
Brandes Mchy. Co., Cleveland, Ohio
Brown Machinery Co., St. Louis, Mo.
Burns Mchy., F. W., Milwaukee, Wis.
Cincinnati Machy. & Supply Co., Cincinnati, O.
Daniels, C. R., Milwaukee, Wis.
DeWitt Tool Co., 173 Grand St. N. Y. C.
Dony Mchy. Co., D. E., Rochester, N. Y.
Eastern Machinery Co., Cincinnati, Ohio
Emerman, Louis E. & Co., 1761 Elston, Chicago
Essley Machinery Co., E. L., 831 W. Evergreen Ave., Chicago, Ill.
Falk Mill Supply Co., Inc., Rochester, N. Y.
Friedrich, Inc., Ed., San Antonio, Tex.
General Blower Co., 401 N. Peoria St., Chicago
Goldman & Co., Harvey, Detroit, Mich.
Harris Electric Supply Co., 627 Wash. Blvd., Chgo.
Hill, Clarke & Co., 4545 W. Washington, Chgo.
Hyman & Sons, Joseph, Philadelphia, Pa.
Indianapolis Mchy. & Supply Co., Indianapolis
Industrial Machinery Co., Indianapolis, Ind.
Inland Machinery Co., 41 S. Clinton, Chicago
Interstate Machinery Co., 109 S. Clinton, Chgo.
Iroquois Machinery Co., Buffalo, N. Y.
Johnson & Sons Mchy. Co., Wm. C., St. Louis
Jones Machine Tool Co., Cincinnati, Ohio
Klauber Machinery Co., St. Louis, Mo.
Lake Machinery Co., 656 W. Lake, Chicago.
Lang Machinery Co., Pittsburgh, Pa.
Logeman, T. V., Normandy (St. Louis Co.), Mo.
Lowe Co., Chas. E., Hartford, Conn.
Lucas & Son, J. L., Bridgeport, Conn.
McDonald Machinery Co., St. Louis, Mo.
Marr-Galbreath Mchy. Co., Pittsburgh, Pa.
Meyer Mchy. Co., Walter H., Fort Wayne, Ind.
Miles Machinery Co., 2025 Genesee Ave., Saginaw, Mich.
Morey Machinery Co., Inc., 410 Broome St., New York, N. Y.
Morris Machinery Company, Inc., Newark, N. J.
Morton Mchy. Co., H. L., Cleveland, Ohio

Buyers' Directory

Used and Rebuilt Machinery—Cont.

Nelson Machinery Co., Green Bay, Wis.
Norton-Broadway Machinery Co., Cincinnati, O.
O'Brien Machinery Co., Philadelphia, Pa.
Osborne & Sexton Machinery Co., Columbus, O.
Ott Mchy. Sales, Inc., Detroit, Mich.
Passman Bros., 705 W. Washington, Chicago
Reeve-Fritts Co., 28 N. Clinton, Chicago
Reliance Machinery Sales Co., Pittsburgh, Pa.
Riverside Mchy. Depot, Detroit, Mich.
Rosenkranz & Weisbecker, 2309-A Singer Bldg., New York City
Scott Mchy. Inc., 1811 Carrolll Ave., Chicago.
Segal Machinery Co., 117 S. Clinton St., Chicago
Simmons Machine Tool Corp., Albany, N. Y.
Standard Machinery Co., Grand Rapids, Mich.
Strong, Carlisle & Hammond Co., Cleveland, O.
Surplus Stock & Mchy. Co., Inc., 618 W. Lake St., Chicago, Ill.
Triplex Mch. Co., Pittsfield, Mass.
United Machinery & Supply Co., St. Louis, Mo.
Victor Mchy. Co., 130 S. Clinton, Chicago
Victor Mchy. Exchange, 251 Centre St., N. Y. C.
Vine, R. A., Detroit, Mich.
Wachs-Gregg Co., 1535 Dayton, Chicago
West Penn Machinery Co., Pittsburgh, Pa.
White Mchy. Co., A. D., 108 N. Jefferson, Chgo.
Wigglesworth Machinery Co., Cambridge, Mass.
Winterhoff Mchy. Co., Detroit, Mich.
Zeeve, Alex, 2280 Woolworth Bldg., N. Y. C.

Vacuum Cleaners, Industrial

Breuer Elec. Mfg. Co., 5108 N. Ravenswood, Chicago

Vacuum Cleaners, Portable

Breuer Elec. Mfg. Co., 5108 N. Ravenswood, Chicago

Valves

Galland-Henning Mfg. Co., Milwaukee, Wis.
Hanna Engineering Works, 1763 Elston, Chicago
Ross Operating Valve Co., Detroit, Mich.

Valves, Air

Air-Way Pump & Equip. Co., 625 Jackson, Chgo.
Bell Machine Co., Oshkosh, Wis.
Galland-Henning Mfg. Co., Milwaukee, Wis.
Hanna Engineering Works, 1763 Elston, Chicago
Logansport Machine, Inc., Logansport, Ind.
Ross Operating Valve Co., Detroit, Mich.
Tomkins-Johnson Co., Jackson, Mich.

Valves, Auto. Self-Open.

Bell Machine Co., Oshkosh, Wis.

Valves, Foot, Lever & Solenoid

Berkeley Engineering Co., Cleveland, Ohio
Hanna Engineering Works, 1763 Elston, Chicago
Nicholson Co., W. H., Wilkesbarre, Pa.

Valves, Hydraulic

Berkeley Engineering Co., Cleveland, Ohio
Galland-Henning Mfg. Co., Milwaukee, Wis.
Hanna Engineering Works, 1763 Elston, Chicago
Ross Operating Valve Co., Detroit, Mich.

Valves, Operating

Berkeley Engineering Co., Cleveland, Ohio
Galland-Henning Mfg. Co., Milwaukee, Wis.
Hanna Engineering Works, 1763 Elston, Chicago
Ross Operating Valve Co., Detroit, Mich.

Vises, Drilling Machine

Armstrong-Blum Mfg. Co., 5741 Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 308 N. Francisco Ave., Chicago, Ill.
Chi. Tool & Eng. Co., 8400 So. Chi. Ave., Chgo.
Desmond-Stephan Mfg. Co., Urbana, Ohio
Heuser Mfg. Co., 1638 N. Paulina, Chicago
Johnson Tool Co., Inc., East Providence, R. I.
Knu-Vise, Inc., Detroit, Mich.
L-W Chuck Co., Toledo, Ohio
Martin Tool & Die Works, Springfield, Ohio
National Machine Tool Co., Racine, Wis.
Plunket Machine Co., 1823 W. Lake St., Chicago
Sheldon Mch. Co., 1629 N. Kilbourn, Chicago

Vises, Machinists'

Desmond-Stephan Mfg. Co., Urbana, Ohio
L-W Chuck Co., Toledo, Ohio
New Britain Tool & Mfg. Co., New Britain, Conn.
Sheldon Mch. Co., 1629 N. Kilbourn, Chicago
Western Tool & Mfg. Co., Springfield, Ohio

Vises, Milling Machine

Chi. Tool & Eng. Co., 8400 So. Chi. Ave., Chgo.
Desmond-Stephan Mfg. Co., Urbana, Ohio
Hartford Special Mchy. Co., Hartford, Conn.
L-W Chuck Co., Toledo, Ohio
Plunket Machine Co., 1823 W. Lake St., Chicago
Sheldon Mch. Co., 1629 N. Kilbourn, Chicago

Vises, Shaper

L-W Chuck Co., Toledo, Ohio
Plunket Machine Co., 1823 W. Lake St., Chicago
Sheldon Mch. Co., 1629 N. Kilbourn, Chicago

Water Cooling Devices for Spot Welders

Eisler Eng. Co., Inc., Newark, N. J.

Welders, Arc

Chicago Electric Co., 1330 W. Cermak Rd., Chgo.
Hobart Brothers Co., Troy, Ohio
Lincoln Electric Co., Cleveland, Ohio

Welders, Arc, Diesel Driven

Lincoln Electric Co., Cleveland, Ohio

Welders, Automatic, A. C.

Lincoln Electric Co., Cleveland, Ohio

Welders, Arc, A. C. Type

Eisler Eng. Co., Inc., Newark, N. J.

Welders, Arc, Engine Driven

Lincoln Electric Co., Cleveland, Ohio

Welders, Portable

Hobart Brothers Co., Troy, Ohio
Lincoln Electric Co., Cleveland, Ohio

Welding Accessories

Hobart Brothers Co., Troy, Ohio
Lincoln Electric Co., Cleveland, Ohio

Welding Electrodes and Holders

Hobart Brothers Co., Troy, Ohio
Lincoln Electric Co., Cleveland, Ohio

Welding Electrode Tips

Eisler Eng. Co., Inc., Newark, N. J.

Welding Generators, Arc

Hobart Brothers Co., Troy, Ohio
Lincoln Electric Co., Cleveland, Ohio

Welding Machines, Electric Spot

Eisler Engineering Co., Inc., Newark, N. J.

Welding Machines and Equipment, E. I. Arc

Hobart Brothers Co., Troy, Ohio

Welding Protective Equipment

Lincoln Electric Co., Cleveland, Ohio

Woodworking Machinery

Tannewitz Works, Grand Rapids, Mich.

Wrenches, Pneumatic

Chi. Pneu. Tool Co., 6 E. 44th, N. Y. C.

Wrenches, Socket, Plain

Apex Mch. & Tool Co., Dayton, Ohio

Wrenches, Socket, Univ. Joint Type

Apex Mch. & Tool Co., Dayton, Ohio

Used and Rebuilt Machinery
Classified Section

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 40c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

FOR SALE BY
Aaron Machinery Co.,
176 Lafayette St., New York, N. Y.

Automatic screw machines, B. & S., No. 0, No. 0G.
Drill, 3½' Bickford radial, s. p. d.
Drill, 4' Mueller radial, s. c., m. d.
Drill, 4' American radial, triple purpose, enclosed hd.
Drills, high speed, Allen, Sipp, LeLand.
Engraving machine, Gorton and Deckel, all sizes.
Filing machine, Thiel No. 3, m. d.
Grinder, Reid No. 2 surface.
Lathe, Hardinge 9"x5' precision, q. c., g.
Lathes, all sizes, all types.
Milling machines, Becker No. 2, 2A vertical.
Millers, B. & S. No. 0, 0V plain.
Millers, Brown & S.; Kempsmith univ , Nos. 1 & 2.
Milling and drilling machine, Triplex combination.
Pipe machines, Oster, Williams, 2", 6", m. d.
Presses, power, No. 2½, 3 V & O, No. 18, 19 Bliss.
Presses and pumps, hydraulic.
Punch, Long & Alstatter multiple 48" between housings, 72" bed, 175 ton ram pressure, wgt. 17 ton, 10" gap, like new.
Shapers, 16", 18", 24" G & E, Queen City.
Wire machines, four slide, 1/8" and 3/16" cap.

FOR SALE BY
General Blower Company
401 N. Peoria St., - Chicago, Ill.

BLOWERS—FANS—EXHAUSTERS.
For Dust Collecting — Ventilating.
Oil and gas burners, cupolas, furnaces, etc.
Roots—Connersville and centrifugal blowers.
What are your blower requirements?

FOR SALE BY
Chas. E. Lowe Co.
174 Pearl Street Hartford, Conn.

Automatic, 1½" Mod. C Acme, 5 spdl., ser. 13011, m. d. (2)
Automatic, No. 82, No. 83, No. 85 Acme, m. d.
Automatic, No. 00, No. 0, No. 2 Brown & Sharpe.
Automatic, 4½" Model A Cleveland, serial over 34,000.
Automatic, 2¾" Model F Gridleys. (2)
Automatic, 1½" Mod. G Gridleys m. d. ser. over 10,000 (4)
Automatic, 1½" Model G Gridleys. (2)
Automatic, 1" x5 New Britain.
Chucker, No. 34 New Britain.
Chucker-Air Chucks, No. 484 New Britain serial 23554, m. d.

FOR SALE BY
H. L. Morton Machinery Co.
12327 Edwin Court, - Cleveland, Ohio

Drill, 3' Carlton radial, s.p.d., with gr. box, Price...$325
Lathe, 21" heavy duty LeBlond, q. c. g., complete with chuck, centers, steady rest and driving plates. Arranged for motor drive. Price.....$750
Milling machine, No. 3-H LeBlond plain with countershaft. Price.....$550
Turret lathe, 3¼"x36" Cincinnati Acme, s. p. d. $800

FOR SALE BY
International Machinery Co.
3131 E. Jefferson Ave., - Detroit, Mich.

Chuck, 15x40 magnetic.
Drills, Natco multiple, all sizes.
Grinder, No. 11 Brown & Sharpe plain, m. d.
Grinder, Persons Arter rotary, 16".
Grinder, 20 Heald rotary, 8".
Lathe, 5A Potter & Johnson automatic, turret.
Mill, 24" Cincinnati duplex.
Mill, 48" Cincinnati automatic, 72" table.
Press, 50 ton Lucas forcing.
Radial gear box, 3' Cincinnati Bickford.
Let us have your inquiries.

FOR SALE BY
Segal Machinery Company
117 S. Clinton St., - Chicago, Ill.

Automatics: 5A & 6A Potter & Johnston, m. d.
Gear hobbers, No. 3 & No. 12 Barber-Colman, m. d.
Grinder, No 33 Abrasive, mot. dr., 6" cup wheel.
Lathes, 24x12 Milwaukee, semi-q. c. g. taper attach. 12x5, 14x6, 16x8, 20x8, Mon-LeBlond—q. c. g.
Millers, No. 3 Van Norman, duplex, swivel hd.; No. 2 Kempsmith univ.; No. 2-B B. & S. plain, s. p. d. No. 2 Garvin duplex; 24" Cincinnati duplex.
Nibblers, Nos. 1B & 2 Campbell, 1" cap. 24" throat.
Presses, 8-ton Gen. Hex. power; 303½ Bliss, s. s., 12" st; Nos. 3 & 4 Bliss-cons.
Punch presses: No. 42 Toledo horn; No. 540 Max. Ams. str. sid.—Back Gear, 8" stroke.
Screw machines, 1½" Acme universal, geared head. No. 4 & 6 W. & S., Plain & universal, bar feed.
Shapers, 16", 20", 24", 28", G. & E., Mil. and Amer. 20" Rockford, hy-service, motor drive.
Swedger, No. 4 Langelier, power infeed.
Partial list — Send us your inquiries.

USED AND REBUILT MACHINERY

FOR SALE BY

Failor-Strafer Machinery Co.

132 Liberty St., - - New York, N. Y.

Bolt cutter, 2" Landis double head, motor drive.
Drill radial, Amer. 3' sens., tapping attachment.
Grinder, No. 14 Pratt & Whitney b. b., vert. surface.
Grinder, No. 16 Blanchard high power vert. sur., m. d.
Lathe, 18"x8' Lodge & Shipley, geared head.
Lathe, 20"x8' Cleveland, geared head.
Lathe, 26"x14' Bridgeford, geared head, m. d., taper.
Lathe, turret 3"x36" J. & L., bar and chucking equipt.
Lathe, turret 18" Libby, geared head, s. p. d.
Lathe, turret No. 2A Warner & Swasey grd. hd., s.p.d.
Miller, No. 8 Becker, duplex Lincoln type.
Miller, plain No. 24 B. & S., table work surf. 72"x13½".
Pipe machine, 4" Williams, motor drive.
Planer, 42"x42"x18' Liberty, 4 hds. modern, rev. m. d.
Shear, squaring 10'x3/16" Loy & Nawrath, arr. m. d.
Table, circular, 42" mounted on base with cross adjust.

FOR SALE BY

Scott Machinery Sales, Inc.

1811 Carroll Ave., Chicago, Illinois

Automatic, ⅜" Gridley's Model G, 4 spindle, motor drive, serial No. 10,000, (6)..... Price $1050.
Automatic, 1¼" Gridley's Model G, 4 spindle, motor drive, serial No. 10,000, (2)..... Price $1250.
Chuck, magnetic, D. & W. 13"x33" 115 volts..... $150.
Cut-off machines, No. 00 Brown & Sharpe (2) ..... Price $275. to $375.
Drill, 1-2-3-4 spindle..... $25 to 400.
Press, No. P.G.6 Ferracute b/g standard 4" stroke, extra Pitman for 2" str. extra bolster plate, reasonable.
Presses, 25 ton Henry & Wright dieing, complete with roll feed. (2)..... each $750.
Screw mchs., Cleve., auto., ⅜" to 7⅛", (40). $125 to $2500.
Brakes, motors, planers, presses, etc.

Write for complete list and prices.

FOR SALE BY

Lang Machinery Company 28th St. & A. V. R. R. Pittsburg, Pa

Air compressors, Ingersoll-Rand XB-2, 600, 888, 1200 & 1500 cu. ft. 100 lb. pressure, motor drive.
Air compressors, (2) Sullivan, 480 c. f. 100 lb. b. m. d.
Air comp. 14"x12" Ing. Rand "ER-1", 464 c. f.
Automatic, No. 52 National Acme 4-spdle. cap. ⅝" b. d.
Automatics, 1½" & 2⅜" cone, 4 spindle, m. d.
Automatic, model "C" National Acme, 1⅜", m. d.
Bolt cutter, 1" Landis, 1½"-3" Acme, sgl. hd., b. d.
Boring mill, 30" Bullard, threading attach., s. p. d.
Boring mills, 42" Bullard "New Era", m. d. (2)
Boring mill, 42" Gisholt, 2 hds., r. p. t., m. d.
Boring mill, 52" Bausch, geared feeds, d. c., m. d.
Boring mill, 54" Bullard, rapid prod., s. p. d.
Boring mill, 72" Niles, 2 heads, d. c., m. d.
Boring mill, 10' Niles, 2 heads, belt drive
Boring mill, hor. 2" No. 1 Cleveland, s. p. d.
Boring mill, hor. 2½" bar Lucas, tbl. type., b. d.
Boring mill, floor type, 3" bar Niles, m. d.
Boring mill, hor. 4½" N. B. P. high column, m. d.
Borer, port., N. B. P. Duplex, 4½" bars, m. d.
Brakes, power, 7' 10 ga., 8' 12 ga., D. & K.
Buffer and polisher, 7½ h. p. Marschke, 220/3/60.
Drill, heavy duty No. 1 Baker, 24" capacity 2½", s. p. d.
Drills, radial, 2½" Cincinnati-Bickford, m. d.
Drills, radial, 3' Fosdick, s. p. d.
Drills, upright, 14" to 32", belt drive.
Gear cutter, 48"x12" Gould & Eberhardt, s. p. d.
Gear hobber, No. 18-H Gould & Eberhardt, s. p. d.
Grinder, disc, 18" Diamond, dbl. end.
Grinder, No. 3 Brown & Sharpe univ., 12"x40".
Grinder, surface, No. 5 Grand Rapids, hyd. feed, m. d.
Grinder, surface, 12" Pratt & Whitney vertical. m. d.
Hammer, 100 lb. Bradley cushion helve belt drive.
Hammer, power, 300-lb. Bradley upright helve.
Hammer, upright, No. 4 Beaudry.
Hammer, No. 5-B Nazel pneumatic, m. d.
Keyseater, No. 0 Mitts & Merrill, b. d.
Keyseater, No. 4 Mitts & Merrill, capacity 2½" b. d.
Keyseater, No. 5 Mitts & Merrill, cap. 3½", m. d.
Keyseater, Baker, 36" stroke, 3½" m. d.
Lathe, 12"x6' Prentice, geared head, q. c. g., s. p. d.
Lathe, 16"x8' Hendey, q. c. g., t. a., b. d.
Lathe, 20"x24' Lodge & Shipley, q. c. g., b. d.
Lathe, 21"x8' LeBlond, grd. hd., t. a., m. d.
Lathe, 24"x10' Bradford, q. c. g., t. a., b. d.
Lathe, 24"x14' Schumacher & Boye, q. c. g., b. d.
Lathe, 24"x14' Lodge & Shipley, q. c. g., d. b. g., b. d.
Lathe, 24"x16' Lodge & Shipley, q. c. g., t. a., m. d.
Lathe, 29"x14' Schumacher & Boye, p. c. g., t. a., b. d.
Lathe, 51"x32' New Haven, triple geared, motor drive.
Lathe, roll, 54"x24' Standard, motor drive.
Lathe, turret, No. 2-A Warner & Swasey, s. p. d.
Lathe, turret 30" Steinle, grd. hd., 8" h. s., m. d.
Miller, Lincoln type, No. 4 Hendey, q. c. g.
Miller, plain No. 1½ Brown & Sharpe, grd. feeds, b. d.
Miller, plain, No. 2 Cincinnati, tbl. 46-½"x10", b. d.
Miller, plain, No. 2½ LeBlond, tbl. 52"x11-½", b.d.
Miller, plain No. 28 Ohio, table 52"x11-½", belt drive.
Miller, plain, No. 3 Cincinnati, b. d.
Miller, plain, No. 4 Kempsmith Maximiller, s. p. d.
Miller, plain No. 4 LeBlond, table 72"x16", belt drive.
Miller, plain No. 5-B Brown & S., grd. hd., s. p. d.
Miller, plain, No. 24 Brown & S. tbl. 80"x17½" b. d.
Miller, univ. No. 3 Cincinnati, tbl. 12"x51", b.d.
Miller, vertical, model "B" Becker tbl. 57"x12", s.p.d.
Pipe machines, Landis ⅜" to 2", belt drive, (2).
Pipe, machine, Standard, ½"—3", b.d.
Pipe machines, Nos. 304-B, 306-A 308-A Oster, m. d.
Pipe machine, 8" Williams, 2½" to 8" motor drive.
Pipe machine, No. 11½ Merrill, 2½" to 12", motor drive.
Planer, 30"x30"x8' Niles-Bement-Pond, m. d.
Planers, 36"x36"x10' Cincinnati, 2 heads, belt drive.
Planer, 42"x42"x11' Woodward & Powell, 3 hds., b. d.
Planer, 72"x72"x16' N.-B.-P., 4 heads, rev. m. d.
Planer, openside crank, 26" type A universal, m. d.
Press, arch, No. 52 Toledo, str. 4½", m. d.
Presses, No. 5 Bliss stiles type, bed 17"x20", st. 2", b.d.
Press, No. 95 Bliss, dbl. crk., str. 3½", m. d.
Press, No. 92 Toledo, dbl. crk., str. 3", m. d.
Press, No. 83 Cleveland, stroke, 2½", roller feed, m. d.
Press, toggle, No. 3½-A Bliss, stand.
Press, trimming, No. 12 Erie, bed 26", str. 5½", side sh.
Press, wheel, 100-ton Caldwell, 33"x96", b. d.
Press, wheel 200-ton Niles, 48"x108", b.d.
Press, wheel, 250-ton Hydro Press Co., b. d.
Profilers, Nos. E3 and E4, Keller, motor drive.
Riveting hammer, No. 5½ B high speed, m. d.
Saw, universal shaping, 6"x6" Peerless, m. d.
Saw, hack, No. 7 Atkins, 8"x8", motor drive.
Saw, hack, 9"x9" Racine, 3 speed, m. d.
Saws, hack, 12"x12" Racine, single pulley drive.
Shaper, 16" American, b. g., o. t.
Shaper, 20" Gould & Eberhardt.
Shaper, 24" Smith & Mills.
Shaper, 24" Gould & Eberhardt.
Shear, No. 1½ Canton alligator, 2½" square, m. d.
Shear, billet, No. FV-23 Pels, 3" round cap., m. d.
Shear, rotary, No. 10 Quickwork, 14 ga. 60° throat.
Shear, plate, No. 5 H. & J., 90"x⅜"—36° throat, m. d.
Shear, plate, No. 52 Morgan, 8'x1¼", 24" throat, m. d.
Shear, squaring No. 242 Niagara, 42"x14 ga. m. d.
Slotter, 8" Betts, table 20" dia. b.d.
Slotter, draw stroke, Baker, cap. 3½"x38", m. d.
Straightener, No. 1 Kane & Roach cap., ½" rd. m. d.
Welder, arc 300 amp. Lincoln, d. c. or a. c.

USED AND REBUILT MACHINERY

FOR SALE BY

Surplus Stock & Machinery Co.,
620 W. Lake St., - Chicago, Ill.

Dieing machine, 25 ton Henry & Wright, roll feed.
Drill presses, h. s., 1, to 4 spindle, hand or power fds.
Grinder, No. 2 Brown & Sharpe, surface, motor driven.
Lathes, 14"x5', 14"x6' American, grd. head, taper att.
Lathe, 16"x10' Monarch, grd. head, motor in base.
Mill, No. 2 Cincinnati, grd., power feeds, vert. hd.
Mill, No. 25 Ohio universal, power feeds, vert. head.
Complete stock of metal working machinery.
Send us your inquiries.

FOR SALE BY

Wigglesworth Machinery Co.
199 Bent Street Cambridge, Mass.

Automatics, ½ model G, Gridleys, serials 17,000.
Grinder, model B, 14" Pratt & Whitney.
Grinder, No. 33 abrasive.
Grinder, No. 16 Blanchard, 26" chuck.
Lathes, turret, No. 4 W. & S., timken bearings, (3).
Millers, Nos. 1B, 2B, 1A Brown & Sharpe, motor base.
Miller, No. 4 Knight vertical, motor base.
Planers, 42"x42"x10' Detrick & Harvey, openside (2).
Radial, 4' American triple purpose.
Radial, 4' Cincinnati-Bickford, enc. head.
Thread millers, Hanson & Whitney, (3).
Send for Complete Stock List.

FOR SALE BY

The Reeve-Fritts Company
28 N. Clinton St., Chicago

Boring machine, 3"No. D Giddings & Lewis.
Boring machine, No. 1 Barrett, cylinder.
Cut-off machine, 12" Peter's abrasive.
Drill, 6 spindle Valley City, adjustable, multiple.
Gear hobber, No. 1 Adams Farwell.
Grinder, production, type R, belt and disc.
Grinder, No. 1 La Salle tool & surface.
Lathe, 13"x6' South Bend, q. c. g.
Press, No. 3½—12 S. & S. o. b. i.
Screw driver, No. 2 Reynolds.
Tapper, No. 1 Garvin, ½" vertical.

FOR SALE BY

Bradley Machinery Co.
529 E. Jefferson St., Detroit, Mich.

Automatic, New Britain 1x5.
Bar shear, Doty (new).
Coining press, Ferracute 150 ton.
Drill, Allen 6 spindle.
Drill, 32" Barnes tapping attachment.
Drill, 26" Rockford sliding head.
Drill, No. 314 Baker.
Drills, 14" Cincinnati high-speed, power feed.
Grinder, No. 70 Heald internal.
Grinder, No 3½E Van Norman radius.
Grinder, radius, 1½ Van Norman.
Grinder, No. 6 Bryant internal.
Hammer, drop, 2500 lb. Chambersburg board.
Mill, No. 1½ Garvin duplex.
Planer, 20x20x6' P. & W.
Press, P02 Ferracute.
Screw machine, No. 1 W. & S.
Shaper, 34" Gould & Eberhardt.
Swedger, No. 204 Etna.
Tappers, Garvin.
Thread roller, W. F., late type.
Hundreds of other items available.

FOR SALE BY

Steinman Bros. Lumber Co.
Jenera, - - - - Ohio

1—25 horse power Fairbanks Morse oil pull engine, Diesel type, apparently good as new, including tanks and all equipments, price $275.00 f. o. b. car or truck. If interested write for further particulars.

FOR SALE BY

Nelson Machinery Co., Green Bay, Wis.

Boiler, 300 h. p. Edgemoor water tube.
Bolt cutter, 2½" National geared head, motor drive.
Compressor, Sullivan 14x8½x10 class WG-3, angle type, 637 CF displ. with 100 H.P Allis Chalmers S.R. motor and control.
Drill, Reed Prentice 3' radial, direct grd. motor drive, 3 hp. 16 spindle speeds.
Gear unit, Falk 12½ H. C., Herringbone, 600 h. p., 200 to 1800 r. p. m.
Generators (2), 200 KW Westinghouse 3-60-2300-514 r. p. m. belted.

FOR SALE BY

Reliance Machinery Sales Company
1405 Brighton Place, N.S. Pittsburgh, Pa.

Air compressor, 8x8 Chicago, 139 cu. ft.
Air compressor, 324 cu. ft. Ing.-Rand, with 60 h. p. motor, 3-60-220 v., a. c.
Angle shear, H. & J. double, 6x6x1", on turntable.
Borer, car wheel, for 42" wheels.
Boring mill, 51" Bausch, 2 heads, rapid traverse.
Bulldozer, No. 9 W. W., 24" stroke, crosshead 16x89½".
Grinder, No. 2 Brown & Sharpe surface, motor drive.
Grinders, Heim centerless, a. c., m. d.
Miller, No. 4 Cincinnati, plain, cone.
Miller, No. 5 B. & S., plain, table 16"x54", cone.
Planer, 36"x36"x12' Cincinnati, 2 heads.
Press, No. 2 Toledo, o. b. i., 4" stroke.
Press, consolidated, s. s., 5" shaft, 6½" stroke.
Press, No. 82-C Toledo dbl. crank, 5" shaft, 44" wide.
Press, No. 97G Toledo, dbl. crank, 8½" shaft, 72" wide, 9" stroke, 75,500 lbs.
Shapers, 16", 20" and 24", various makes.
What do you need? What have you for sale?

FOR SALE BY

Joseph Hyman & Sons,
Tioga and Almond Sts., Philadelphia, Pa.

WORLD'S LARGEST STOCK
POWER PRESSES

No. SG 115 Ferracute, dbl. crank, tie rod" 60", crk. 5½".
No. 5C Bliss (2) double crank, tie rod, 54", crk. 5" 54".
Bliss double crank, gap. grd. 7½" crank, bed 97"x18".
No. 138 Bliss, double crank, flywheel, 79", crank 5".
Nos. 94C, 93B, 92D, 91C Toledo dbl. crank presses.
Nos. 54, 55, 57, 59½ Toledo, geared straight side.
Nos 5C, 3½B tie rod, 3½C & 4 Bliss toggle presses.
No. 910B Stoll, toggle press, 7" 8" crank, 8½" draw.
No. 40 & 39B Bliss, Nos. 14 & 13 Toledo horning.
No. 512 Niagara, geared, straight side, 8½" shaft.
150 ton No. EWG 52 Ferracute, 75 ton EG51 Ferracute.
500 ton American Can Coining, 75t. No. E51, Ferracute.
200 ton No. 59 Bliss, 250 ton Waterbury F. coining.
100 ton No. 21 Bliss, 80 ton No. 3 Bliss coining.
Squaring shears, various sizes.
Gang slitter, 60", Braddock, type H.
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here.
Rebuilt and Guaranteed.

USED AND REBUILT MACHINERY

FOR SALE BY

Hess-Schenck Company

3951 St. Clair Ave., - Cleveland, Ohio

MULTIPLE DRILL.

Bausch 24-spindles, 2" diameter, No. 3 M. T., rect., head, 40x58" O-A. motor driven, oil gear feed, large supplementary table, practically new.

FOR SALE BY

Standard Machinery Co.,

347 Indiana Ave. Grand Rapids, Mich.

Automatic, 1½" Gridley, model F.
Boring mill, 42" Bullard vertical.
Boring mill, 2½" Lucas horizontal.
Drills, 26" Barnes and 26" Rockford, p. f., b. g.
Grinder, No. 2½ Walker surface.
Grinder, No. 4 Badger disc, motor drive.
Lathes, Porter-Cable Mfg. (10).
Miller, model C-1 Becker heavy vertical.
Miller, No. 2V Reed-Prentice m. d. vertical.
Saw, 6" Higley cold metal.
Shaper, 15" Hendey, f. g.

FOR SALE BY

Bleser Machinery Company

209 N. Sixteenth St., - Springfield, Ill.

Air compressor, unit, automatic.
Exhaust fans, 18" and 20" and blades.
Lathe, 22"x8', taper attachment, $250.
Lathe, 36"x18' L. & S., q. c., arranged motor drive.
Shaper, 32" American, arranged motor drive, $325.

FOR SALE BY

Rosenkranz, Weisbecker & Company, Inc.

2308 Singer Building, New York, N. Y.

Boring mills, 5" & 6½" bar Detrick & Harvey, m. d.
Drill, multiple spdl., No. 30 Natco, m. d., 20" round hd.
Gear cutter, 110" Newton, motor drive.
Grinder, 26"x120" Landis, plain, cylindrical, m. d.
Grinder, Cincinnati 24", face mill, motor drive.
Keyseater, No. 20 Catlin, m. d.
Lathe, 60"x25' Gleason, motor drive.
Lathe, 42"x18' Pittsburgh, quick change gear.
Planer, 72"x72"x32' N.-B.-P. 4 heads, rev. m. d.
Rolls, angle bending, 6"x6"x1" cap., m. d.

FOR SALE BY

West Penn Machinery Company

1210 House Building, Pittsburgh, Pa.

Air compressors, 30 to 2500 cubic feet.
Air compr. portable gas 1-R 180 cu. ft.
Automatic National Acme "C" 9/16, m. d. 220/3/60.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutters, 2" & 3" Acme, b. d.
Boring mill, 66" Betts, 2 heads, belt drive.
Bulldozers, Nos. 2, 4, 6, 9, 28, & 30.
Crane, 5 ton case, 65' 3" span, 220 v., d. c.
Crane, 10 ton Whiting, 43' Span, 220 d. c.
Crusher, jaw, No. 4 Champion, b. d.
Drill, radial 6' Reed-Prentice, single pulley drive.
Drills, 4 spindle Allen, No. 2 m. t., s. p. d.
Drill, multiple 25 spindle No. 30 Natco.
Drills, upright 16" to 36".
Engine, gas, 20 horse power Bessemer.
Flanger, McCabe, 4" capacity, dies.
Flanger, No. 208 Niagara, 10 Ga. b. d.
Gear cutters, Nos. 5 & 6 B. & S., 60" & 72" m. d.
Gear cutters, 11", 18" & 24" Gleason.
Gear tester, bevel 18" Gleason.
Grinder, centerless, No. 2 Cincinnati m. d. 220/3/60.
Grinders, centerless Heim, m. d., 220/3/60.
Grinder, drill, No. 31 Oliver, 1½", m. d., 220/3/60.
Grinder, knife 10' Bridgeport, m.d.
Grinder, roll, Farrel 28"x16".
Grinders, D. E. 2—3 & 5 h. p., 220/3/60.
Grinder, tool & cutter, No. 1½ Cinc., m. d.
Grinder, disc, No. 8—20" Besly, belt drive.
Grinder, disc, No. 4 Gardner, motor drive, 220/3/60.
Grinder, Gisholt tool and cutter, motor drive, 220/3/60.
Groover, No. 275-A Niagara, 6', 16 ga. motor drive.
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammer, power, 100 lb. Bradley cushion helve.
Hammers, Nos. 2-B, 3-B, 4B, 6-B, Nazel.
Hammers, steam, forging & drop.
Hoist, 1 ton Shephard 220-V, direct current.
Keyseater, No. 2 Mitts & Merrill, belt drive.
Lathe, 20x12 S.-B. E., t. a., q. c. g., b. d.
Lathe, 26"x12' Putnam, q. c. g., d. b. g.
Lathe, 42"x16' Schumacher Boye, q. c. g., belt drive.
Lathe, wheel, 78"x84" Bement, motor drive.
Lathe, spinning 32" belt drive.
Lathe, turret, W&S No 2A & No. 3A s.p.d.
Lathe, turret, 17x6 LeBlond double back gear 1¾".
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, vertical No. 2 Knight, b. d,
Miller, vertical No. 6 Becker, motor drive.
Mixers, Sprout-Waldron, batch & liquid.
Pipe machine, 2", 4", 6", 8" Landis-Oster-Williams.
Planer, 36x36x10' Cincinnati belt drive.
Press, forging, 150 ton United, steam hyd.
Press, wheel 150 ton Caldwell, 42", b. d.
Press, hydraulic 100-ton Southwark.
Presses, OBI, No. 19 Bliss & No. 4 Toledo, 3 str.
Press, No. 85 Toledo, bed 30x15.
Press, double crank No. 5 Bliss, 2" stroke, b. d.
Press, gap, No. 74 Bliss consolidated 4½" stroke.
Press, screw, No. 87 Niagara, hand power.
Press, 6 spindle, Waterbury-Farrell.
Press, arch, No. 30 Bliss, roll feed, b.d.
Punch, EF Cleveland, 36" throat, 1¼" thru 1".
Pumps, centrifugal 6", 4", 1", motor drive.
Riveters, air, hammer, spinning.
Rolls, angle, Niagara 1½x1½x¼".
Rolling mill, coil 9"x18" motor drive.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, cold, 48" Newton motor drive.
Shapers, 16", 20", 24" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x1 Long & Allstatter, m. d.
Shear, 60"x3/16" Niagara, 15" gap, b. d.
Shear, 8 x14 ga. Ohl, m. d., 110/220/1/60.
Shear, circle, Niagara, 4" cutters, 16 ga.
Shear, circle No. 3 Bliss, 40"x20 gauge.
Shear, Guill., No. 5 H. & J., 4½" rd., m. d.
Shear, 10'x¼" Bliss, holddown, b. d.
Shear, plate, 80"x¾" Pels.
Shear, 36" & 42" Niagara, 18 ga. b.d.
Shear, rotary 24" throat capacity ½", m. d. 220/3/60.
Slitter, gang, No. 2 W-F, 18", belt drive.
Slitter, gang, 36" Yoder motor drive.
Slitter, gang, 36" Braddock, belt drive.
Slotters, 6" & 24" Newton.
Straightener, AS & TP 12"x3/16", belt drive.
Straightener, 42" Aetna std. 17 roll 2½" m. d. 220/3/60.
Straightener, 48" Aetna-Standard, 17 roll 3½", m. d.
Straightener, No. 2 K. & R., 1½" square, m. d.
Straightener, No. 5 K & R., 2½" square belt drive.
Thread rollers, W-F No. 7—1½" & No. 20—¾".
Thread roller, No. 201 V. & O., 4", belt drive.
Tumbling barrel, 34"x45", belt drive.
Upsetters, 1" to 6".
Welder, spot 13 k. v. a, Taylor.
Welders, arc, 200 & 300 amp. Lincoln.

USED AND REBUILT MACHINERY

FOR SALE BY

Acme Equipment Company

128 So. Clinton St., - Chicago, Ill.

Grinder, Heald rotary, No. 210, 8" magnetic chuck.
Lathe, Seneca Falls, 12"x8', motor drive.
Lathe, South Bend, 13"x6', belt drive.
Milling machine, Brown & Sharpe No. 2A universal.
Mills, Milwaukee plain, Nos. 2A & 1B, dbl. overarm.
Nibbler, Campbell, 3/16" cap. 24" throat, m. d.
Press, Stiles type, 70 ton cap., 1½" stroke.
Shears, power square, 30, 36, 42, 60 and 120".

FOR SALE BY

Russell Machine Co.

438 Oliver Bldg. Pittsburgh, Pa.

Boring mill, Bullard, 42" New Era type.
Boring mill, 42" Gisholt, 2 heads., m. d.
Boring mill, hor. N. B. P. 4½" bar floor type.
Gear hobber, No. 18H Gould & Eberhardt, s. p. d.
Generating set, 400 k. w., a. c. steam.
Grinder, No. 3 Brown & Sharpe universal, m. d.
Hammer, 5000 lb. double frame NBP steam.
Lathe, 26"x13' Chard, hvy. duty, q. c. g., t. s.
Lathe, turret No. 2-A W & S ser. above 125,000.
Lathe, 26—48"x14' McCabe 2-in-1 l. c. g., b. d.
Lathe, 82"x23' Pond triple geared.
Pipe cutting and threading machine 6" Merrill.
Planer, Cincinnati 36"x36"x10' table.
Press, No. 5 Bliss type, 2" stroke, b. d.
Saw, hack, Racine 9"x9", m. d.
Shaper, 24" Gould & Eberhardt.
Shear, alligator, United, cap. 5" square.
Shear, plate, No. 5 H. & J., cap. 90"x¾", m. d.
Sprue cutter, No. 7 Z. & H. m. d., cap. 1¼" dia.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

FOR SALE BY

Wm. C. Johnson & Sons Machy. Co.

1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Automatic, cone, 1¼", 4 spindle, complete.
Boring machine, 42" Betts.
Boring mills, 6'—6' & 8'—12' Betts.
Boring mills, 44".
Die slotter, Garvin, 3½" stroke.
Drill, Allen 4 spindle, No. 3 taper, 12" overhang.
Drill, No. 2 Fox, 6 spindles.
Drill, Moline hole hog, 5-sp. No. 4 Morse taper.
Drill, radial, 4' Dreses and 4' Fosdick; 3½' Mueller.
Drills, 15" to 42" Barnes.
Gear hobber, No. 2 Adams.
Hammer, steam, 2500 to 250 lbs.
Lathe, 8" hollow spindle, I. Johnson, 35" swing.
Lathe, 14"x6' Hendey belted m. d. taper attach.
Lathe, 18"x8' Boye & Emmes, q. c.
Lathe, 36"x12' Lodge & Shipley.
Lathe, 27"x16' L. & S. q. c. g.
Lathe, 36"x15' Amer. q. c. g., cone head.
Miller, No. 4 LeBlonde universal cone drive.
Pipe machines, 2"—4"—6"—8'—12"
Press, No. 58 Toledo, double geared, 30"x30".
Press, No. 79 Toledo, o. h., special, 24" stroke.
Press, 407 A Bliss double crank toggle.
Presses, Nos. 2, 3 & 4 Marshalltown.
Presses, 3, hydraulic pump & accumulator.
Punch, Cleveland E. F. art jaw, 47" thr., with Lysholm spacing table, m. d., one-man control.
Saw, 12"x12" Racine and Nos. 2 & 1 Marvels.
Shapers, 12"—16"—20"—24".
Punches, shears, bulldozers.
Testing machine, 100,000 lb. Riehle.
Large stock guaranteed electric motors. Any size.

FOR SALE BY

C. R. Daniels

1514 W. Capitol Drive, Milwaukee, Wis.

Brake, No. 146 Chicago power driven bending.
Grinder, No. 1 LeBlond motor driven tool & cutter.
Press, No. 358 Bliss 400 ton double toggle drawing.
Saw, No. 4 Wells motor driven band metal cutting.
Shear, No. 296 Kutscheid power driven squaring.

FOR SALE BY

Davis Machinery Company

1-3-5 So. St. Clair St. Toledo, Ohio

Brake, 12'x14 ga. Chicago, power, leaf type.
Brake, 4'x3/16" Chicago, power, leaf type.
Gear hobber, No. 12 Barber-C., dbl. over-a. rapid-trav.
Grinder, No. 11 Brown & Sharpe, s.p.d., late type.
Milling machine, No. 1½ Brown & Sharpe, s.p.d.

FOR SALE BY

J. P. Rentschler & Company

6722 N. Maplewood Ave., Chicago, Ill.

Beaders, Niagara, bench type.
Hammers, No. 1 Grant & No. 4-A high speed riveting.
Polisher, No. 3 Gardner, ball bear., (Dumore grinder).
Press, 15-ton Lucas forcing.
Presses, Nos. 2, 3 and 4 Bliss stiles type punching.
Press, No. 21 Consolidated horn with bolted table.
Press, No. 21 Bliss inclinable, flywheel type.
Press, No. 136 Niagara deep throat, (depth 24").
Shear, No. 212 Pexto power squaring. 18 ga. x 42".
Many other BARGAINS. Send us your inquiries.

FOR SALE BY

Jones Machine Tool Company

Front & Pike Sts., Cincinnati, Ohio

DRILL

3' American, s. p. drive; 4' Bickford, s. p. drive.
Radial, Fosdick 5', semi enclosed head.

LATHES

36x14' American triple geared, cone drive.
24"x30' Lodge & Shipley, q. c., cone drive.
18"x8' Monarch grd. head, motor drive.
16"x10' Lodge & Shipley q. c., cone drive.
16"x10' Hendey tie bar head, q. c., cone drive.
29x14' Hendey, tie bar, cone drive.
14"x6' Willard geared head, motor drive.

MILLERS

No. 34 Ohio 3 S cone; No. 4 Cincinnati, 4 S cone.

PRESSES

No. 6-A Toledo, open back inclinable.
No. 6-H Toledo, open back inclinable, geared.
No. 17 Stoll open back inclinable.
No. 6A Toledo incl. back geared.
All sizes inclinable and horning presses.

SHEARS

10'—14 gauge Robinson 8" gap, motor drive.
48"x16 gauge Queen City, 12" gap.
No. 5 L. & A. shear, 54"x¼" cap., 18" gap.

MISCELLANEOUS

Boring mill, 42" King vertical.
Hack saws, 12x15 & 6x6 Racine; 6x6 Peerless.
Keyseater, No. 1 Davis motor drive.
Planer, 36x12 Gray, 2 heads.
Shaping saw, 6x6 Peerless.
Shapers, 17 & 21" Smith & Mills.
Shaper, 24" G & E. V ram.

A LARGE STOCK ALWAYS ON HAND—
LET US HAVE YOUR INQUIRIES

USED AND REBUILT MACHINERY

FOR SALE BY

General Machinery Corporation
140 Federal St., - Boston, Mass.

Drill, Leland-Gifford floor, 10,000 r. p. m.
Drill, Fairbanks 20" W. & L. feed.
Lathe, Sloan & Chase bench, ⅜" capacity.
Miller, LeBlond No. 3 plain.
Planer, Gray 22"x8'.
Planer, Gray 27"x7'.
Planer, Niles-Bement-Bond 54"x60"x16', two heads.

FOR SALE BY

Alex Zeeve
2280 Woolworth Bldg., New York, N. Y.

Drills, radial, 2', 3' and 4'.
Hammers, power, Beaudry "Champion" 400 lb.
Iron worker, Pels, No. 16 universal, arr. motor drive.
Lathe, 16", 18", 20"x8', 10', 12' beds, quick change.
Presses, o. b. i., Bliss No. 18, a. c. motor drive, (3).
Shapers, 24" Stockbridge heavy duty b. g. cone, auto. down feed; also others.
Shear, circle & slitting, Niagara No. 316-B, 3/16" cap.
Shear, throatless, Marshalltown No. M-10, a. c. motor drive, 10 gauge capacity.
Also many other good tools.
We buy used machine tools.

FOR SALE BY

C. C. Howarth Machinery Co.
1440 Franklin St., Detroit, Michigan

Drills, 1, 2, 3, 4-spdls., high speed, b. b.
Grinder, 16" Person-Arter, rotary.
Grinder, No. 20 Heald rotary, m. d.
Grinders, No. 70, No. 75 Heald internal.
Grinder, 12x24 Diamond hydraulic, m. d.
Hammer, 800 lb. Bradley upright helve, m. d.
Planer, 36" Liberty open side, m. d.
Press, 50 ton Lucas forcing.
Shaping saw, 6x6 Peerless univ., m. d.

FOR SALE BY

Wachs-Gregg & Co.
1535 Dayton St., - - Chicago, Ill.

GOOD USED TOOLS FOR SALE.
Gear cutter, No. 4 B. & S., belt dr., with lot of cutters.
Milling machine, No. 4 Cincinnati, plain, belt drive.
Planer, 48"x48"x12" Belmer with 3 heads, belt drive.
Planer, 48"x14' Cleveland open side, motor drive.
Press, punch, No. 87½ Niagara s. s., 5" shaft, 5" stroke.
Press, punch, No. PG5 Ferracute.
Shaper, 24" Rockford b. g. crank, belt drive.
Turret lathe, 34" Gisholt, variable speed motor drive, very little used.

FOR SALE BY

Marr-Galbreath Machinery Company
57 Water St., Pittsburgh, Pa.

Air compressor, 4x5" Worthington, 23 cfm., m. d.
Blower, pressure, No. 11-PB Am. 14375 cfm., m. d.
Boring mill, 42" Bullard vert., p. r. t., m. d.
Boring mill, 30" Bullard vert., threading attach., b. d.
Brake, 8'x12 ga. Chicago, power, belted.
Brake, 10'x14 ga. Chicago, hand.
Brake, crimp and corrugating, 10'x16 ga. Keene.
Drill, radial 3½' Bickford g. b., m. d.
Drill, Barnes, 20" all geared, m. d.
Drill radial, 6' Amer. univ., g. b., m. d.,
Drill, radial, 6' R. P. plain, g. b., s. p. d.
Drill, 3' radial, Dresses rd. swing table, t. a.
Drills, gang, 3 and 4 spindle, 1 to 4 MT.
Exhauster, No. 35 Buffalo, outlet 12x14", m. d.
Fan, ventilating, 24" American, m. d., 1/60.
Fan, 24 Sirocco, 4960 cfm. 4" wp., m. d.
Forging machine, 1½" Acme, all steel, side shear.
Furnace, gas fired, Tate-Jones "GOF", I. D. 16½"x11".
Furnace, T-J., 25x23x12" I D. 17000 f.
Grinder, plain No. 10 B. & S., s. p. d., collet att.
Grinder, tool & cutter No. 1½ Cincinnati.
Grinder, portable surface, No. 6-OA, motor, 3/60.
Grinder, univ. C. & R. No. 3 B. & S.
Hammer, 50 lb. Boss, No. 2, with dies belted.
Hammer, 50 lb. Bradley upright strap.
Hammer, 100 lb. Little Giant, belted.
Hammer, 200 lb. Bradley upright helve, motor drive.
Hammer, 300 lb. Beaudry "Champion", b. d.
Hammer, 400 lb. Bliss board drop (rebuilt).
Hammer, 1000 lb. Chbg. steam drop, double frame.
Keyseater, No. 3 M. & M.
Keyseater, Horton, cap. 2½"x24", s. p. d.
Lathe, 7½x30", Dalton, type B-4, screw cutting.
Lathe, 9' x4' Sonth Bend, No. 322A, motor drive.
Lathe, 20"x12' American geared head, m. d.
Lathe, 22"x12' Rahn-Larmon, pl. change gears, t. a.
Lathe, 24"x10' L. & S., 5-step cone, q. c. g.
Lathe, 26"x10' Wolcott, q. c. g., d. b. g., 2½" h. s.
Lathe, 36"x16' N-B-P. geared head, m. d.
Lathe, 42"x32', New Haven, q.c.g., motor 270 v., d. c.
Marking machine, No. 3 Noble & Westbrook.
Miller, vertical, No. 3 Becker, table 28x10".
Milling mach. univ. No. 3 Kempsmith, cone.
Milling machine, univ. No. 4 B. & S. cone.
Milling machine, pl. No. 3 Cincinnati, cone.
Nailing machine, No. 6 Morgan, 8-track, m. d.
Nut runner, No. 4 B. & D. ¾", motor 110 v.
Pinion cutter, No. 3 Sloan & Chase, capacity 1x1".
Pipe machine, 4" Oster, m. d.
Pipe machine, 4" Williams, cap. ⅜" to 4", m. d.
Pipe machine, 18" Wieland "Standard", m. d.
Planer, 26"x26"x8' Niles, 1 hd., belt m. d.
Planer, 30"x30"x8' Cincinnati, 1-rail, 1-s. h., m. d.
Presses, No. 18 Bliss, o. b. i., 1½ & 2" stroke.
Press, No. 21 Bliss, 2" stroke, for motor drive.
Press, o. b. i. No. 9 Thomas, 1½" str., 650 lb. (new).
Press, o. b. No. 3 Perkins, pl. str., 1½".
Press, o. b. i. No. 1 Thomas, 2" stroke, m. d.
Press, o. b., No. 61 Bliss, 4" stroke, m. d.
Press, punch, P-2, Ferracute, m. d.
Press, sgl. crank, 50½ Toledo, str. 9".
Press, wheel, 60-ton W-S., 34"x8½".
Press, wheel, 200-ton, 93"x16".
Punch & shear, S. E., 12" tht. ½"x8"; Rock River.
Punch & shear, S. E., 15" tht. ½"x8"; No. 3 L. & A.
Riveters, No. 3-A, and 120 Grant, m. d.
Rolls, 30"x6" United, 2-rolls (for leather).
Saws, metal, 4x4" & 10"x10" Napier, m. d., (3).
Screw machine, turret No. 1 Garvin, w. f.
Screw machine, turret No. 1½ Dreses, w. f.
Shaper, 24" Barker, "v-ram".
Shaper, 15" Blount, (planer drive).
Shaper, 16" Smith & Mills, gear box, motor drive.
Shaper, 21" Averbeck, b. g., cone.
Shaper, 24" Milwaukee b. g., V-ram.
Shaper, 28" American b. g., gear box. m. d.
Shear, alligator, 1½", 8" blade.
Slotter, 3½" Rhodes, bench, rotary, table.
Tapping machine, ½" Pratt & Whitney, b. d.
Testing machine, 1000 lb. Olsen hyd., hand.
Tiering machines, 600 and 1000 lb. Economy, hand.
Tumbling barrel, No. 2 Baird, tilting.
Turret lathe, 18"x6' Springfield, Fox Monitor.
Unishear, B-36" Stanley, ½", motor drive.
Unishear, 0-36" Stanley, 14 ga., motor drive.
Welder, arc, 300 amp. Star, 3/60/220 v.
Welder, arc, 250 amp., a. c. Hampton (new).

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Have over 1,000 machines listed. Mail inquiries.

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Centering machines, revolving and stationary hd. types.
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Grinder, No. 2 Brown & Sharpe cutter & reamer, m. d.
Hammer, Bradley 25 lb. upright strap.
Lathes, 16" Lehman, Monarch, Bradford d. b. g., q. c. g.
Millers, 0Y Brown & Sharpe; No. 1 Kempsmith plain; Newton horizontal production—16x55 table, No. 1 Knight vertical.
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Shaper, 24" Cincinnati, motor drive.

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Press, DG 53 Ferracute, m. d.
Press, moulding hyd. with pump, 85 ton.
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Swager, S-204 Etna, motor drive.
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Automatic screw machine, 2¾" model "F" Gridley 4-spindle, serial 8568.....$750
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Lathe, 14"x6' Mulliner.
Linear measuring machine, P. & W.
Millers, P. & W. 6"x14", thread, m. d.

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Nos. 00G, 0G & 2G Brown & Sharpe.
2" Cleveland, Model C.
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Band Saws, Metal
No. 8 Marvel motor drive, (2).

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20" to 28" Barnes and Milwaukee.
No. 2 Avey, arr. M. D., 12" over-hg.
1 & 2 spindle, Allen, M. D., B. B.
3 sp., Leland-G. B. B., mtr. & p. f. on ea. sp., 12" over-hg., No. 4 taper
4 spindle Leland-Gifford, p. f.
6 spindle Kerns B. B., M. D. tapping attach. on each spindle.

Gear Hobbers
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Nos. 3 & 12 Barber-Colman, M. D.

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No. 3 Brown & Sharpe universal.
Nos. 10 & 11 B. & S. Cyl., M. D.
No. 27 Gardner, motor driven.
Disc, Nos. 4 & 6 Gardner, B. B.; 26" Badger, B. B.
No. 3 Wilmarth & Morman surface.
No 2 B. & S. surface; No. 2 Reid.
No. 210 Heald Rot. Surface, 8" chk.

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6"x6" Peerless Univ. Shap., M. D.
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Lathes
14", 16", 18" Hendey.
14"x6' Lodge & Shipley.
14"x6' & 16"x6' Bradford.
14"x6' American, Grd. Hd., M. D.
14"x8' & 20"x8' American.
20"x9' & 28"x11' Hamilton.
20"x10' & 24"x12' Schumacher.
42"x16' Schumacher.

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Duplex No. 3½ Pratt & Whitney.
Pl. No. 1 Knight; No. 1½ Valley City;
Universal, No. 2 & No. 2A B. & S.; Nos. 1 & 2 Kemps.; No. 35 Ohio; No. 1½ Cincinnati.
No. 2B Brown & S., Pl., S. P. D.
Vertical Nos. 3-H & 4-B Becker.

Nibblers
Nos. 1, 1B & 2 Campbell.

Planers
42"x42"x14' Hamilton.
30"x30"x6' Columbia.

Presses
Cam Drawing, No. 1 Bliss b. g.
Horn, No. 22 Consolidated.
O.B.I. Nos. 1, 2½, 3½ & 5A Toledo; No. 16 Stoll, M. D.; Nos. 4 & 5 Bliss, B. G.
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3' Cin-Bickford, Motor Drive.
5' Carlton, M. D., Enclosed Head.

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16" & 21" Milwaukee. B. G.
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20" Rockford, hi-ser., M. D.
24" Stockbridge, M. D.

Shears
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Cleveland Single End Punch.
No. 55 Beloit comb. punch & shear.

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Nos. 0 & 1 Foster, Hand.
Nos. 2 & 4 W. & S., G. F.H., M.D.

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Arc: 200 amperes USL.
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60" Colburn Boring Mill.
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No. 2 Ryerson Friction Saw, M. D.
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BROWN & SHARPE No. 2 Hand Screw Machines, Power Feed to Turret, c./s. drive.
GOULD & EBERHARDT Crank Shapers, Cone Drive 24'—16'—14'.
CLEVELAND 2¾' Automatic Model A.
GRIDLEY 1¾' 4 Spindle Automatic Model F, countershaft drive.
BROWN & SHARPE No. 0 Automatic Screw Machine, countershaft drive.
LOY & NAWRATH 10 ft. Power Squaring Shear, 3/16 capacity, m. d.
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1—14" Pratt & Whitney Surface Grinder with A. C. motor drive complete.

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No. 4 Warner & Swasey Friction head.
No. 4 Warner & Swasey Universal High Head.
No. 6 Warner & Swasey Dbl. Back Gr. cone dr.
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18" Libby Model C Turret, 3½" hole in spdle.
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24" Gisholt Turret, 6¼" hole.
Acme Grd. Hd. Univ. Cross Slide Turret.

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Surplus heavy machine tools of the LONG & ALSTATTER CO.

84"x72"x18' Detrick & Harvey Openside Planer. Two swivel heads on rail, one side head. D. C. reversing direct motor drive with control.

72"x48"x14' Gray Planer, two rail heads, one side head. Variable speed self contained countershaft.

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20"x8' Lodge & S. Sel. Grd. Hd. Taper. S.P.D.
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30"x20' Amer. 12 speed Grd. Hd. S.P.D.
36"x22' Lodge & S. Sel. Hd. S.P.D. Taper.
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84"x72"x18' Detrick & Harvey Openside Planer.
24"x24"x6' Gray Planer.
30"x30"x16' Gray Planer.
36" Cinc. Openside Crank Planer, M.D.
16, 20, 24" G & E Shapers, cone drive.
16, 20, 24 and 28" Gould & E. Shapers, S.P.D.
20" Amer. Shaper, M. Mak. Tbl. & vise. S.P.D.
16" Ohio Crank Shaper, Cone drive.

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3½', 4', 5', 6' Amer. Triple Geared S.P.D.
4', 6' American Triple Purpose S.P.D.
4' Dreses Plain Radial, s.p.d.
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No. 1, 2, 3 Adams Farwell Gear Hobbers.
18H Gould & Eberhardt Gear Hobbers.
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No. 3-26", 3-36", No. 4-36" B & S Gear Cutters.
No. 2HS Lees Bradner Gear Grinders.

Millers
No. 3 Cincinnati Plain, 3 S.C.D.
No. 2 Rockford Universal, Cone drive Comp.
No. 4 Cincinnati Hi.P. Cone 3 S.C.D.D.B.G.
No. 4 Cinc. H.P. Cone Univ. 3 S.C.D., D.B.G.
No. 2 Cincinnati Plain Cone.
No. 3 Kempsmith Univ. Cone complete.

Grinders
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No. 2 B & S Surface M.D.
No. 1 Diamond Surface Grinder.
No. 50, 550, 60, 65, 70 Heald Internal.

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60" Gisholt Vertical Rapid Traverse. S.P.D.
60" Niles Car Wheel Borer.

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No. 7 Foster Univ.
No. 4 & 6 W & S Plain Cone Drive.
14"x19" Fay Automatic.

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1—42"x12' Liberty Open Side Planer.
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1—Gould & E. No. 36 S T Gear Rougher.
1—54" N. B. P. Vert. Boring Mill, 2 heads.
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1—No. 14 Natco Mult. Drill; 12—1¾ O. D. spindle.
3—No. 310 Baker H. D. Drills.
1—No. 416 Baker H. D. Drill.
1—84" Diamond Face Grind., arr. for M. D.
1—3¾" National Acme 4-spindle Automatic.
2—⅞" Model "G" Gridley Automatics.
5—Cleveland Automatics.
1—15x9x10 Chicago Pneum., class O. C. E. m. d. Air Compr., 600 cu. feet of A. P. M.
1—1½" Acme Steel Bed Upset., arr. for M.D.
1—3" Acme Steel Bed Upset., arr. for M.D.
1—Model "IB" Cleveland S. E. Punch, 36" Throat, Cap. 2—1⅛" holes in 1" material.

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N. B. P. 5', 6½" bar horiz.
Lucas 4" bar horizontal.
Universal 3½" bar horizontal.
Landis No. 35, 3½" bar, horiz.
Cleveland 2½" bar horizontal.
Bullard 24" 36" N. E. vertical.
Gisholt 42" vertical 2 heads.
N. B. P. 72" Vert. 2 heads.
Bullard 8' Mult-Au-Matic; 6 sp.

LATHES
Pittsburgh 36"x38', geared hd.
Putnam 36"x28' g. h., nearly new
Bridgeford 36"x60' boring.
Hendey 14" to 24"x6' to 12'.
Lodge & Shipley 16"x8' grd. hd.
Reed Prentice 24"x18', 24"x20', 200 other lathes—all sizes.

PLANERS
Cleve. 48"x48"x16', 4 hds. o. s.
American 36"x36"x20'; 3 heads.
W. & P. 60"x42"x19'—4 heads.
Niles 60"x60"x12', 2 heads.
Niles 72"x72x14', 2 heads.

DRILL PRESSES
Natco Nos. 12, 13 & 22 mult. sp.
Natco C11 drill, mechanical fds.

DRILL PRESSES—Cont.
Natco C13H drill, hyd. feeds.
Pratt & W. No. 12 rect. head.

AUTO. SCREW MCHES.
B. & S. No. 00G & 2G auto.
Cleveland 2", 2½" mod A auto.
Gridley ¾", ⅞", 1¼", 1¾", 2¼".

GRINDERS
Heald No. 25 and No. 25A hyd.
Pratt & Whitney No. 14 surface.
Heald No. 20, No. 22, No. 255.
Heald Nos. 55, 60, 65, 70 inter.
Landis 6x20, 10x36 hyd. pl.
Landis 6x18, 10x24, 12x36 pl.
Norton 10x36, 14x72 plain.
Landis 16x32, 16x48 crankshaft.
Norton type B-81, 14x30—36".
B. & S. No. 1, No. 3 univ.

MILLING MACHINES
Brown & S. Nos. 2 & 3 univ.
B. & S. Nos. 3B, 4B, 5B plain.
Brown & Sharpe No. 1Y plain.
K. & T. No. 3B, 4B Pl. Mo. Ba.
Brown & Sharpe No. 5 Vertical.
Hanson & Whitney Thread.
Cincinnati 18", 24", 48" auto.

MILLING MACHINES—Cont.
Lees-Bradner No. 8.
Ing. 24x24x12', 36x36x12', 3 hd. adj. rail.

GEAR CUTTING EQUIPT.
Barber C. Nos. 3, 12 g. hobbers.
Brown & S. No. 13H gr. cut.
Gould & E. 18H, 36H Gear Hobber.
Cleveland 8 spindle spline hob.
Gleason 10", 15" spiral bevel.
Gleason 24", bevel gear.
Fellows No. 8B burnisher.
Fellows Nos. 6, 61, 515, 7, 71, 7A.
Lees Bradner lapper, cap. 1¼x8"

TURRET LATHES
Gisholt No. 1-L.
W. & S. No. 4 Univ. Gd. Hd.
W. & S. No. 1A, No. 2A.
Cincinnati-Acme No. 1, No. 3.

MISCELLANEOUS
American 6' Univ. Radial Drill.
American 5' trip. purp. Radial.
Bliss No. 27K, coining press.
Sellers 42" wheel lathe.
Riehle 50,000 lbs. Testing Mch.
Dill 24" Slotter.

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Good Used Machinery

ARC WELDER—Wilson 300 amp., 15 h.p. motor; portable; UNA 300 amp., 10 h.p. motor.

BORING MILLS—Niles 36" c. d. Baush 44" m. d. N-B-P 54" s. p. d. Vert. with 2 heads; Barret 5" bar. c. d. horizontal; Bullard 51" Vertical 2 heads; Rock. No. 2 horiz.

BRAKES—189, 5' Box & Pan, 14 ga.

DRILLS (RADIAL)—Mueller 2½', Fosdick 2½', Prent. 3'; Carlton 4' all gear box dr.; Hammond 4' sensitive; Amer. 2½" M.D. gear box. Mueller 4½' g.box.

DRILLS (H. S. B. B.)—H & W 2, 4, 5sp.; Allen 2 & 6-sp.; Avey, Demco, Lel-Giff. 1-sp.; Avey 2-sp.

DRILLS (MISC.)—Baker No. 217 (2) & No. 314 Hvy. Duty; Hamilton 42" S.H.; Barnes 20" & 24" 1-sp. & 20" 4-sp. & 24" 3-sp. all grd. camel back; P & W No. 12 Multi-Sp.; Natco 20-sp. Rect. head.

GEAR CUTTERS—G & E 60" & B & S 26" s. p. d. automatic spur; Fellows 24" gear shaper. Cincinnati 36" gear cutter.

GRINDERS—P & W 12" vert. surf.; Cin. No. 1½ & B & S No. 12 univ. tool, B & S Nos. 11 & 16 plain, Heald Nos. 60 & 65 Int.; B & S No. 13 Univ. & Tool; Landis 10x30" Plain; B & S 10x48"; 3—Norton 6x32" plain, Heald No. 20 Rotary Surface (3). B & S No. 2 Univ.; Badger No. 220, auto. d. e., opposed disc (4); Walker 8" Rot. Surf.; Modern No. 6 Internal & Ohio No. 3 Univ. Tool.

KEYSEATER—Mitts & Merrill No. 5 vert.

LATHES—Monarch 16"x10' M.D.; LeBlond 18x8'; Lehmann 18"x9'; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. q; Flather 22"x10'; Bradford 21"x10'; LeBlond 16"x8'; P & W 17"x10'; Gleason 45"x12'; Johnson 36" x24'; Monarch 16"x8' (2). Hendey 14"x6' & 16"x8'.

MILLING MACHINES—Van Norman No. 2 duplex; Ohio No. 29 Univ.; Kemp. No. 3; B & S No. 3; Cleve. No. 1 s. p. d. univ.; Amer. No. 1½; Cin. No. 3; B & S No. 3; Hendey No. 3; LeBlond No. 3; Mil. No. 3-B & Cinc. No. 3 s. p. d. pl.; Becker Model "B" & No. 6 vert.; Kemp. No. 33 spd. Prod.; Ingersoll slab, M.D. 33", table 30½"x16'; LeBlond No. 4 m. d. pl. Cin., No. 1½ Univ. M.D.; Cin. No. 4 pl. High Power; Cin. 12" Mfg. & 24" Auto. Cleveland No. 2 S.P.D., Pl.

PIPE MACHINES—Landis 12" A.C., m.d.;

PLANERS — Gray 30"x30"x10' 2 heads; Gray 48"x48"x10'; Gray 28"x28"x6' 1-hd.; Pond 32"x34"x10'; Hamilton 60"x 36"x10'.

PUNCH PRESSES—Toledo No. 3, o.b.i.; Federal Nos. 1, 2, 3 o.b.i.; Bliss No. 62 geared; Ferracute No. P-4; Toledo No. 52 arch; Fer. No. EGF 52 Coining; Willard No. 4A o.b.i.; Swaine No. 38 arch, geared; Cons. No. 3, L & J No. 3; Swaine No. 37 o.b.i.; Bliss No. 83 Reducing.

SAWS (HACK)—Racine 6x6" H. S.; Peerless 6x6" H. S. (4); Peerless 6x6" M. D. Univ. Shaping (2).

SHAPERS—S & M, G & E, Ohio, Mi., O. City, Davis, Cin. 16"; Ohio & G & E 20"; S & M, O. City, Rock. 24"; Ohio 26"; Cin. 24" s. p. gr. box; Rhodes 3½" Vertical; American 24" heavy, b.g. Amer. 15"; Springfield 15".

SCREW MACHINES—W & S No. 4 & No. 6 Hand; Nat. Acme. Nos. 515, 52, 55, & 56 4-sp.; Gridley 4-sp. ⅞"; Automatic, B & S No. 00 auto; B & S No. 0 Auto.

SLOTTER—Bement-Miles 10" vert.

SQUARE SHEARS—D & K 52" 14 GA. Power; Toledo 72" 14 GA.

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

THREAD MILLERS—Moline No. 10; Lees-Bradner No. 3 (2).

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BLOWERS: Sturtevant, Buffalo, etc., M.D.

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FURNACES, Plate Heat. (4); Rivet Heat. (23).

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60—AIR HOISTS ½, 1, 2, 3, 4 and 6 ton cap. Ingersoll Rand & Detroit.

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JOINTERS: Fay & Yates 8" and 10".

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MOTORS: 2 to 30 H.P.—AC—3-60-220/440 V.

PLANERS: Gray 52"x60"x14' Table 52"x144"; Gray 42"x60"x15'6"; 48" betw. hous.; Cincinnati 24"x24"x80"; Hermance No. 50-J-12.

PUNCHES—Horizontal: Cleveland Type T. 1" thru 1"; 6" gap; 10" reach; Beatty No. 1; PUNCHES—Vert. Sql. End; 2—No. 4 Kling; 48" thr.; Arch. Jaw; Beatty—48" thr.; 2—No. 14 Williams & White; 36" throat.

PUNCH—Multiple Gang: No. 30-A Williams & White; Bed 32"x12'9"; 10" shaft.

PUNCH AND SHEARS: No. 9 Beatty; 17x26" bed; 21" thr.; No. 11 Williams & White; 15" thr.; No. 11 Beatty; 18" thr.; No. 12 Williams & White; 20" thr. 27"x20" bed; No. 13 Williams & White; 18" thr. 30" gap; 50 Ft. Spac. Table; No. 14 W. & W. 15" thr.

BEAM PUNCHES: No. 10 Beatty; 24" thr. 44" height of gap; with 54 Ft. Spacing Table; M.D.; No. 10½ Beatty; 24" thr. 36" gap; with 50 Ft. Spacing Table; M.D.

PRESSES, Hydraulic: 400 ton Southwark; 30" dia. ram; 42"x54" betw. columns; 1000 ton Birdsboro; Triple ram each 30" dia. Platens 10x12 Ft. with pump, tank, accumulator.

PUMPS: Hyd.; Size 4⅝"x15"; Directly con. 225 H.P. 8 cyl. Uniflow Steam Engine.

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SHEARS with hold-down and gauges M.D. 48"x9/16" Beatty—90" gap; 12 ft. x ⅝" Beatty; 27" gap; 12'x⅝" W. & W.; 15" thr.

THREADERS, Bolt & Pipe: Bolt—1¼" Landis 2-head; Bolt-1" Land.; 2-hd.; Pipe-No. 2 B.&K.

ARC WELDERS: 200, 300, 400 & 500 Amps.

UPSETTERS: 1¼ & 2½" Acme; with motor.

MISCELLANEOUS: Locomotive — Baldwin, 8 wheel tender; Oil Separator; Slotter—No. 508 Bement Niles. max. stroke 12"; 6 stor. tanks 10,000 to 120,000 gal. cap.; Testing Machines; 2 Scales; Tractor, Int'l Harv. 1-20; Truck, 1½ ton Ford, stake body.

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24"x24"x6' Gray, 1 head.
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24"x24"x6' Smith & Silk, 1 head.
24"x24"x8' Cincinnati, 2 heads.
28"x28"x10' Cincinnati, 1 head.
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30"x30"x10' American, 1 head.
30"x30"x12' Cincinnati, 2 heads.
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Oil Gear Type XB10 Twin Ten Hy., m.d.
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PRESSES, Double Crank
L. & A Gang, 48" bet.; No. 6 Nia. 36" bet.; No. 8-F Bliss, 120" bet. hsgs., 20" str.
No. 7-F Bliss, 96" between uprights.
No. 96-G Toledo, 149" between uprights, 24" str., tie-rod, wt. 162,000 lbs.
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PRESSES, Toggle
No. 408-B Bliss, 84" bet. up.; 58x84.
No. 5; No. 3¾; No. 3½A; No. 3½B Bliss
PRESSES, O.B.I.
No. 6A Bliss, 7" st., No. 5 Toledo.
No. 3 Nia.; No. 62 Bliss, 8" st.
No. 4 L. & J.; No. 4 McDonald.
PRESSES, Horn
Nos. 14¾; No. 44P Toledo, swing table, 14½, No. 41; Bliss No. 21; No. 24.
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600 ton Waterbury-Farrel.
PRESS BRAKES
Chicago All Steel 52" 18 ga., 10' 10 ga.
Ohl. 5' 16 ga. gap type; 10' 10 ga.
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Angle Iron Shears, Coving., 6x4x⅜", dbl. end.
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84"Niles; 10'x16' Niles Ext. Type.
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Brakes, hand, 10' 14—8' 16, 8' 12, 8' 18.
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Lathes, 30"x16' L&S., 48"x18 Schu. & Boye.
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Screw mach., auto., 4 spdle. Gridley, 1¾"
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Shear, Pels angle & beam, 8x8x¾".
Shears, throatless, 10 ga. ¼", ½".
Shears, power, 13' ⅜" 8' ⅛" Bertsch; 10' ⅜", 10' 3/16", 10' 10 ga.; 10' 16 ga.; 10' 14 ga. Bertsch. Chgo. Steel, 52" ⅜"; 6'x½" gap; 8'x10 ga. Stoll; 6' 10 ga. Rob., 10' 18 ga.
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Welders spot: 5, 7½, 10, 25, 50KW; press type 100 KW Federal; 75 KVA National.
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Cone ⅜"; 1¼"; 1¾" four spindle M.D.
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Niles, spindle diameter 4-7/16"

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Dries & Krump 6' hand, cap. 16 ga.

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Baker No. 217 hvy. dut., S.P.D. (2)
Barnes 20" 4-spds. morse taper No. 4, P. F. on each spindle.
Allen, 6-Spindle B. B. overhang 7".
Avey, single spindle, B. B.
Leland & Gifford 4-Sp. H. S. B. B., tapping chuck on each spindle.

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Brown & Sharpe No. 3 universal,
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Ingersoll cutter Tub (2).
Wilmarth & Morman No. 2 Surface.
LeBlond No. 1 Tool & Cutter (2).
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McCabe dble. spindle, 26"x48"x12'.
Rahn & Carpenter 32"x14'l.-c. 98%.
Fifield 36"x12' loose-change.

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Ingersoll 24"x24"x10'. two side heads one head on rail m. d.
P. & W. No. 4 vertical Die Sinking, equip. with cherrying attachment.
Warner & Swasey Valve two spindle with Index head,
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Bliss No. 3½-B Toggle single geared 8" stroke.
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Detrick & Harvey open side 36x28x8' Motor Drive.
Woodward & Powell 30x30x8'.

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Pexto 30", 36" foot pwr., cap. 18 ga.
Rock River No. 2-R Comb. Punch & Shear, Motor Drive.
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American 16", Smith & Mills 20", Ohio 24", Smith & Mills 26".

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Warner & Swasey, No. 1, 2, 4 6 and 3-A Universal.
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Wells cap. ⅜ and ½".

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3½" Detrick & H. Floor Type M.D.

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6" x 10" x 48" Norton Hydraulic Surface, M. D.
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Several — No. 0 Waterb.-Farrel D. S. S. D., M. D.
Several — No. 1 Waterb.-Farrel D. S. S. D., M. D.
No. 3 Manville, D. S. S. D.
No. 22 Waterb. Farrel D. S. S. D.

LATHES

12"x6' Hendey Yoke Head.
14"x6' Hendey Yoke Head.
14"x5' American Geared Head.
14"x6' American Geared Head.
14"x6' Bradford, M. D.
16"x6' Monarch Helical Geared.
16"x8' Bradford, M. D.
16"x10' Prentice Geared Head.
18"x10' Lodge & S. Geared Head.
28"—48"x16' McCabe Dbl Spdl.
26"—48"x24' McCabe Dbl. Spdl.

MILLERS

6"x14" Pratt & Whitney Thread.
6"x48" Pratt & Whitney Thread.
6"x80" Pratt & Whitney Thread.
No. 0Y Brown & Sharpe Plain.
No. 1Y Brown & Sharpe Plain.
No. 1M Cincinnati Plain, M. D.
No. 13B Brown & Sharpe Plain.
No. 33 Brown & S. Auto., M. D.
No. 2 Kemps. Vert., Maximiller.
No. 3 Cincinnati Vertical.
No. 3 Brown & Sharpe Univ.
24"x24"x10' Ingersoll Planer.

SCREW MACHINES

Nos. 00G, 0G, 00, 0, and 2 Brown & Sharpe Automatics.
⅝" Gridley Model "G", M. D.
Two—1⅜ New Britain Automatic, M. D.

SHAPERS

16" Gould & E. High Duty Crank.
24" Gould & Eberhardt Crank.
24" Stockbridge Crank, M. D.

TURRET LATHES

No. 1 Warner & Swasey Brass,
No. 3 Foster A. G. H.
No. 5 Foster Geared Head.
Three—No. 2L Gisholt.
2¼"x24" Jones & Lamson Steel Head.
3"x36" Jones&L. Steel Hd., M. D.
4"x34" Jones & Lamson Steel Head, m. d.

J. L. LUCAS & SON, INC.

3 FOX ST. — BRIDGEPORT, CONNECTICUT

MILES' QUALITY TOOLS

BORING MILLS

3" Binsee knee type.
3½", No. 0 Giddings & Lewis.
3½", No. 5A Defiance.
4" D. & H. floor type.
24" Bullard with side head.
34" Colburn single turret.
36" Niles car wheel.
42" King.
42" Detrick & Harvey.
51" Bullard.
80" Gisholt.

DRILLS

21", 24" & 28" Cincinnati.
24" Barnes all geared.
21", 24", 28" Superior.
24" Aurora.
30" Snyder.
No. 121, 217, 314, 315, 321 Baker
No. 2 Mfg. Colburn 1, 2, 3, 4 spdl.
Natco multiple, Nos. 11, 12, C12, 13, C13, 14, B14 & 30.
No. 1 Baush multiple.
No. 1 Pratt & Whitney gun.
6 spdl. Pratt & Whitney deep hole.
Nos. 6D, 11D & 16D Moline.
No. 10D Moline cylinder borer.
5 spdl. Detroit automatic.
Nos. 15½ & 17 Foote Burt.
2½' Morris radial.
3' American sensitive radial.
3' Dreses radial.
3' Cint. Bick. radial.
3½', 4', 5' and 6' Western radial
4' Mueller radial.
4' Hammond radial.
5' American triple purpose radial.
6' N.B.P. univ. radial.
Sensitive; All makes and sizes.

FORGING TOOLS

Nos. 25, 8 & 9 Williams & White bulidozers.
Nos. 3B & 5I Nazel hammers.
No. 1A Ajax forge rolls.
1", 1½" 2" & 4" Ajax upsetters.
1¼" Acme upsetter.
½" No. 3 W. F. cold header.

GEAR CUTTERS

Nos. 8 & 12 Barber Colman.
Nos. 12HS, 18H & 36H Gould & Eberhardt hobbers.
Nos. 1 Mfg. & 5A Lees Bradner.
28" G. & E. spur. & bevel.
36"x10" Newark automatic.
Nos. 3 & 4 B. & S. auto.
Gleason quenching press.
Nos. 6 & 77A Fellows.
Fellows hourglass generator.
Nos. 2 & 2½ Bilton auto.
Gleason bevel tester.
Ingle tooth rounder.
G & E cutter grinder.
Fellows cutter & gear checker.
National Cleveland cutter & gear checker.
No. 10 B Lees Bradner gear grinder.

GRINDERS

No. 2 Cincinnati centerless.
Nos. 72A3 Heald internal.
No. 12 Bryant internal.
No. 3 Barber Colman hob.
16"x32" Norton crank.
16"x48. Landis crank.
No. 4 Brown & Sharpe univ.
21" Gisholt.
1¼", 3½" Cincinnati Acme.
24" Bullard vertical.

MILLERS

Nos. 3 & 4 Cincinnati.
No. 2 Hvy. & 3B B. & Sharpe.
Nos. 2A, 2 Hvy. Mfg. Milw.
No. 4 Hendey.
No. 4 LeBlond.
No. 2 B. & S. universal.
No. 2½ Rockford.
No. 3 Keuupsmith.
No. 4 Leblond.
No. 3 Cincinnati universal.
Nos. B1 & 6 Becker vertical.
Nos. 3-24 & 4-36 Cincinnati Hydromatic.
24" & 48" Cincinnati duplex.
18" 24" & 48" Cincinnati, auto.
48" Ohio tilted offset.
Hanson Whitney thread miller.
Nos. 13B & 33 B.&S. Mfg.
Nos. 1 & 2 Kent Owens hand.
66"x36"x8' Ingersoll adj. rail.
30" & 42" Ingersoll rotary.
48" & 54" Newton rotary.
Davis & Thompson drum
Model C Becker vertical.
No. 3 Sundstrand Rigidmil.
28". 37" & 42" Briggs.
Taylor & Fenn spline.

PLANERS

24"x24"x2' Cincinnati crank.
24"x24"x6' Gray.
32"x32"x12' Niles.
36"x36"x10' Cincinnati.
36"x36x16' Cleveland openside.
42"x30"x10' Liberty openside.
48"x36"x10' Liberty openside.
48"x48"x12' Woodward & Powell.
56"x56"x16' Gray.

SHAPERS

7" Rhodes.
10" McMahon.
15" Potter & Johnston.
16" Ohio.
16" Kelly.
16" Walcott.
16" Steptoe.
20" Hendey.
24" Gould & Eberhardt.
24" Potter & Johnston.
24" Walcott.
24" Cincinnati shaper planer.
25" Cincinnati.
Nos. 1, 2 & 2½ Bath universal.
No. 16 Blanchard surface.
6"x18" No. 2 B. & S. surface.
6"x36" Norton surface.
7"x45" Bath surface.
8"x38" Manhattan surface.
14" Pratt & Whitney BB surface.
14"x48" No. 5 Abrasive surf.
16"x48" Diamond surface.
20"x50" Safety Emery surf.
30"x84" Diamond face.
18". 24" & 30" Gardner disc.
Nos. 8 & 221 Badger disc.
24". No. 84 Gardner opp. disc.
30". No. 96 Gardner hydr. face.
8" Arter auto. piston ring.
Landis:—6"x18" to 16"x53".
Norton:—6"x32" to 14"x72".
Modern:—12"x24".
Cin.:—12"x36" & 12"x48" univ
No. 184 Greenfield cutter.
Woods tool and cutter
National Tool worm
Pratt & Whitney worm
No. 524 Mummert Dixon Swing.
Gisholt tool grinder.
24" Ingersoll tub.
No. 60 Heald cylinder.
No. 20 Bath spline.

ENGINE LATHES

10"x5" Pratt & Whitney.
12"x6' Monarch.
13"x6' Willard.
14"x6' Monarch.
16"x6' Monarch.
16"x6' Cisco geared head.
16"x6' Hendey geared head.
16"x6' Pratt & Whitney grd. hd.
16"x6' Cincinnati.
16"x8' Cincinnati, grd. hd.
16"x8' Lodge & Shipley grd. hd.
16"x9' Lehmann geared head.
16"x10' Leblond.
18"x10' Morris geared head.
20"x8' Monarch.
20"x10' Reed Prentice grd. hd.
20"x12' Morris grd. hd.
21"x18' Leblond.
22"x10' Davis.
22"x10' Rahn Larmon.
24"x10' Hendey.
24"x12' Lodge & Shipley.
24"x14' American grd. hd.
24"x16' Boye & Emmes
25"x14' Leblond grd. hd.
26"x11' Wickes.
26"x12' Hendey.

LATHES, TURRET

Nos. 2, 2A, 3A & 6 W. & S.
Nos. 1B, 3 & 4 Foster.
18" Libby.

2100 TOOLS IN STOCK. SEND FOR LIST.

MILES MACHINERY CO.

SAGINAW, MICHIGAN

3000 MACHINES IN OUR WAREHOUSES

BORING MILLS

Bullard 24" New Era.
Niles 42", 2 head.
B. 36", 42", 2 hds. on rail.
Colburn 54", 2 heads.
Bullard 76" vertical.
Lucas No. 21 Horizontal.
Rockford No. 2, 2" bar.
Barrett No. 2 cyl., 5" bar.

DRILLS

P. & W. No. 1 Gun Barrel.
P. & W. Nos. 11, 12, 13 Mult.
Cin.-Bick. 3', 4' Radials.
N-B-P 6' Radial, Univ.; Reed-Prentice 6' Radial.
Upright Drills—All mak. & siz.
Allen 3, 4, & 6 sp. B.B.
Leland Gifford 3 Sp.; All p.f.
Detroit No. 2, 5 Spdl. Hor.

GRINDERS

Abrasive No. 5 Surface, m.d.
Blanchard No. 16.
Heald No. 20, 255 Rot. Surf.
B. & S. Nos. 1, 2, 3, Univ.
Bryant Nos. 6, 10A, 18A, S-A.
2 Sp. Hole, No. 40 Chuck.
Disc Grind.—All makes & siz.
Heald No. 70, 85 Internal.
Heald No. 70-A Intern. m.d.
Rivett No. 6, 103 Internal.
Nort., 6x32", 10x36", 10x50", 10x72", 14x36" Pl. Cyl.

LATHES

Hendey Lathes—most sizes.
American 20"x8', g.b.
New Haven 24"x10', 24"x12', 24"x20'.
LeBlond 17"x16', Q.C.G.
Pittsburgh 32"x24', q.c.g.
W.&S. Nos. 1A, 2A, 3A Tur.
W-F No. 3 Chucking.
Fay & Scott 32", 56"x8' gap.

MILLERS

Brown & Sharpe No. 2A Univ.
Cin. No. 2 Vert. S.P.D.
Kempsmith No.3Un.; Milw. 2½B Vert. 2B, Pl.
Becker No. 6 AB V.
Van Norman No's. 4, 2, 3, Dupl.
Lincoln Millers of all kinds.
P. & W. 6x14"; 6x48", 6x80" Thread millers.
Milw. & Garvin Cam Millers.

PRESSES

Bliss No. 18, 19 & 20 O.B.I.
V. & O. No. 12, 14 D.A.C. In.
Zeh & Hah. 8½C Percus.
Bliss No. 21, 100 ton K. J.
W-P 200 ton Knuckle Joint
Wat.-P. No. 6 D.A. Pillar Cam.
Ferracute No. 105 D.A.
Ferr. D.G. 53 S.S. Draw.
Terkelsen D-1 150 t. M. Spring.
Stand. No. 4-R S.S. Reducing.
Ferracute No. PG-P4.
Henry & Wright 25 & 50 ton Dieing Machines.
Bliss No. 16, 4" str., Overh.

SCREW MACHINES

Grid. 9/16" & 1¼" Mod. G.
Clev. ⅜", ½", ⅝", ¾", 2", 2¼", 2¾", 4¼" Auto.
B.&S. Auto.—most sizes (we are specialists).
New Brit. 1x5", 1⅝x7" A.
Davenport No. 2—M.D. Auto.
Cone 1¼" Automatic.
Hand Screw M. of all makes & sizes; W. & S., Foster, B.&S.
Jones & L. St. Hd. T. L. 2¼"x24", 3x36".

MISCELLANEOUS

Broaches, LaPointe 1-2-3-4.
Burnishing Barrels, Abbott.
Hammers-Board Drop, must be moved.
Headers, many sizes & makes.
Lapper-Norton 15C.
Measuring Machines, P.&W. 12", 24" & 48".
Profilers — Many in Stock.
Rolling Mill, Robertson 12"x12" for non-ferrous metal.
Shapers—from 7" to 32".
Slitter, Braddock 36" M.D.
Tapper—Threadnut No. 2 auto. nut.
Wire Formers, Nilson&Baird.

BOTWINIK BROTHERS, INC.

37-127 WATER ST. :-: NEW HAVEN, CONN.

IF WHAT YOU WANT ISN'T HERE *Send Us Your Inquiry*

DRILLS:

Radial, 3 ft. Fosdick.
Natco Type K 20-spdl.
Rail, Foote-Burt Nos. 2 & 4, 4 spdl.
Allen BB 5-spindle.
Allen BB Type B sgl. spdl.
Demco DAH BB, MD.
36" Cincinnati BG PF SL.
26" Barnes BG PF SL.
25" Bickford, G. E., American BG PF SL.
20" & 24" Prentice BG.

GRINDERS:

Cylindrical, 12x42", 10x30" Landis.
Disc, No. 6—20 Besly.
Disc, No. 220 Badger & press.
Drill, New Yankee, D. E.
Universal No. 2 B. S.
Internal, Madison, Nos. 60 & 65 Heald.
Surface, No. 210 Heald 8".

HAMMERS:

50-lb. Little Giant MD.
40-lb. Bradley Helve.

LATHES:

32"x20' Gleason PCG.
26"x12' Putnam Pacific type DBG, Semi-QCG, T. A. 26" Chuck.
18"x8½' Rahn & Mayer.
18"x8' Lodge & Shipley MD.
18"x11' Lodge & Davis.

LATHES—Turret:

16" Type A Gisholt, 6½" hole.
21" Type H, Gisholt, 3⅜" hole.
24" Type I Gisholt, 4⅜" hole.
24" Type I Gisholt, 4⅞" hole.
No. 4 Bardon & Oliver 1½" cap., b. g. and p. f. to turret.

MILLERS:

No. 1-B Kearney & Trecker Plain.
No. 2 LeBlond, plain, M. D.
Nos. 2 & 3 Kempsmith, plain.
No. 25 Becker-Brainard.
No. 3B Owen, DH, Vert. att.
No. 12 Brainard.

PRESSES:

Hydraulic, 42-ton Elmes.
OBI, No. 0, 4½ Loshbough-Jordan.
Str. Side, No. 7 Z & H, geared.
Str. Side D-44 Pexto OBI No. 29 Swaine.

PUNCHES & SHEARS:

Queen City DE. ½ in ½", M. D.
Rock River L. ½ in ½"; 24" thr.
Cleveland C. SE. ⅜ in ¾", 26" thr.
No. L-10 Badger. DE. ½ in ½".
No. 14½ W-W.
No. 54 Beliot S. E.

SHAPERS:

20" Smith & Mills BG.
20" Cincinnati, traveling head, MD.

SHEARS:

Jig, GEM, 18 ga. cap., M.D.
Rotary Bevel, Lennox ¾".
Square, Stark 9'; 18 ga. cap.

THREADERS, Pipe & Bolt:

Murchey, ¾" dbl. head, bolt.
Pipe, 2" Outer M. D.

MISCELLANEOUS:

Bender, No. 15 Wallace.
Dbl. Seamers, Swain.
Compressor, H-B CCB, 14x9x8, 20 HP motor.
Groover, 30" Toledo.
Planer, 42"x42"x16' Putnam.
Saw, cold, No. 2-B Cochr.-Bly.

Brown Mchy. Co., 2333 N. Ninth St., St. Louis, Mo.

Guaranteed

DRILLS

28" Cin-Bick. Tap. Att., Gr. Box.
20" Barnes all-grd. self-oiling.
No. 2, 4-spindle Aveymatics.
No. C-5 Natco, 10 spindles.
No. 13 Natco Multiple Spdle.
1, 2 & 3 Sp. Allen H. S. B. B.
4 spindle L-G No. 2 M. T. p. f.
4 spindle Avey, B. B. 2 M. T.
6 Sp. Allen, 8' O. H., H. S. B. B.
3½' Morris rad. A. C. Mtr. Dr.
3½' Fosdick rad. gr. box s.p.d.
5' Dreses Univ. rad., arr. m. d.
6' American Triple Purpose Maxi-Sp. 17" Col. Tap. Att. A. C. motor mounted on arm. Extra right angle base.

GEAR HOBBERS

No. ½ Schuchardt & Schutte.
No. 3 Barber Colman, m. d.

GRINDERS

Nos. 1 & 3 B. & S Univ. 3 mtrs.
No. 1 Brown & S., Univ. B. D.
No. 20 Heald rotary surface.
12" Arter Rot. Surface M. D.
No. 1 Gardner B. B. Disc.
No. 200 Heald Rot. Surface.
No. 14 Gardner Opposed Disc.
No. 7½ Gardner, 30" Disc, B.B.
No. 2 Gardner disc. 18", disc pr.
No. 2 B & S surf, b. d. & m. d.
No. 1 Wil. & M. B.B. Hand Surf.
No. 2 Norton cutter & reamer.
No. 1 Cincinnati tool & cutter.
5 H. P., 18" Queen City Disc, b. b., New.
No. 2 Heim Centerless, M. D.

LATHES

30"x16' H S. & Gamble, q. c. g.
24"x12' Schum. B. q.c.g., t.s.
20"x13' Cisco Grd. Hd., M. D.
20"x10' Schu., Boye & E., q.c.g.
20"x9' Hamilton, q. c. g.
18"x8' B. & E., q. c. g., t. s.
18"x8' Barnes, p. c. g.
16"—24"x10' S. B. Gap.
16"x6' South B., q. c. g.
16"x6' C. & J., grd. hd., Timken Bearing, motor in base, new.
14"x8' Hendey, Q.C.G.
14"x8' Hendey, cks. & collets.
¼" & ⅜" Hardinge Bench.
9"x12" Sundstrand Mfg. grd. hd.

LATHES (TURRET)

No. 4 W. & S. cone head.
No. 4 W. & S. spd. G. H. M. I. B.
No. 5 Foster All Grd. Hd. S.P.D.

54" BULLARD NEW ERA TYPE VERTICAL TURRET LATHE WITH SIDE HEAD, A. C. MOTOR DRIVE.

No. 27x30 U BUFFALO UNIVERSAL IRONWORKER, A. C. MOTOR DRIVE.

No. 4 GALLMEYER & LIVINGSTON HYDRAULIC SURFACE GRINDER, 12" x 24" CAPACITY, A. C. MOTOR DRIVE.

No. 6 GALLMEYER LIVINGSTON HYDRAULIC SURFACE GRINDER, 12" x 48" CAPACITY, A. C. MOTOR DRIVE.

No. 3A W. & S. Univ. 3-11/16" Hole, M. D., Air Chuck.
No. 2A W. & S. univ. 3¾" Hole, s. p. d.

MILLING MACHINES

No. 2 Ohio Heavy Univ. S.P.D.
No. 2 Kempsmith Universal.
No. 3 Kemps. Univ. B. G.
No. 3 Kemps. Plain, B. G.
No. 4 Hendey Norton Pl. S. P.D.
No. 4B Becker, vert., b.b., spdl.
Model "B" Becker, h. p., vert.
No. 2½ Rockford universal.
No. 3 Rock'd Rigidmill, M. D.
No. 6 Whitney hand, motor dr.
No. 2Y, B. & S. Pl., mtr. drive.
No. 2, Van Norman Sub Head.
No. 1 B. & S. Plain, cone head.
No. 2 Chicago Duplex Bench.
No. 3 Burke Bench.
6x14 Pratt & Whitney thread.

PRESSES

No. 5 Bliss-Cons. o.b. i. single grd., Air Cushion, b. d.
No. 4 Rockford o. b. i. Geared.
No. 4 Walsh o. b. i., Geared.
No. 1 Bliss Cam, Fly & Grd.
No. 6 Fox "Superflex".
20 Ton Stecher Screw.
No. 1 Loshbough J. o. b. i.
Nos. 2 Bliss-Cons. obi. B. D.
No. 2R & 3R Rockford obi new.
Model "B" Rockford obi Bench.

SCREW MACHINES

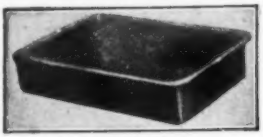
No. 0G B. & S. Auto. M. D.
No. 00G B. & S. Auto. M. D.
No. 0 B & S Hand m. d.

SHAPERS

24" Milwaukee back grd. crk.
20" Hendey B. G. Crk. S. P. D.
20" Steptoe b. g. crank.
20" G. & E. & Milw. b. g. crk.
16" G. & E. b. g. crank.
16" Steptoe b. g. crank.
16" G. & E. Gear Box, M. D.
24" Stockb. b. g. crank, M. D.

MISCELLANEOUS

Bolt Cut., 2½" Landis Lead Scr.
Bor. Mill, No. 3A Univ. Hor.
Broach, No. 2 LaPointe S. P. D.
Broach, No. 3 Oilgear.
Comp. 7x6 Worth. Dup., M. D.
Die filer, No. 5 Rearwin, m.d.
Die filer, No. 5 Thiel, motor dr.
Elec. Furnace No. 659 S. C. & H.
No. 2 Grant Riv. Ham., ¼" cap.
Keyseater, No. 2 Davis, ⅝" cap.
Nibbler, No. 2 Campbell, M. D.
Planer, 30x30x10' Am. Box Tbl.
Punch & Shr., No. 55 H. & W.
Riv. Hammer No. 1 AA Hi. Spd.
No. 2A Hi. Sp. Riv. Ham.
Riv, Ham. No. 3A & 3A H. D., Hi. Spd.
Riv. Htr. ½" Berwick Elec. 440 v.
No. 2 Klemm Metal Band, M. D.
Saw, 6x6" Peer. univ. shpg. m.d.
Saw, 9x9" Peerless, high speed.
Scleroscopes, Mod. "C" & "D" Shore.
Shear, 6'x14 ga. D. & K. Gap.
Shear, 10'x14 ga. D. & K. Pwr. Square, Motor Drive.
No. 138 Marshalltown Rotary Serpentine Shear. Var. Speed A. C. Motor Dr.
Slotter, 3½" Garvin Die.
Slotter, 10" Sellers.
Slotter, 3½" Rhodes Vertical.
Slotter, 12" Newton vert. B. D.
Tapper, No. 1 Garvin, m. d.
Welder, 10 kva Amer. Elec. Fus.
Welder, 12½ K. W. Fed. Spot
Welder, No. 20A Thomp. Butt.



21x14x5½—16 gauge

25,000

Used One Piece Steel Tapered

TOTE PANS

50¢ each

PASSMAN BROTHERS

705 W. Washington Blvd., CHICAGO, ILL.

OTT MACHINERY SPECIALS

AUTOMATICS; No. 2-G Brown & Sharpe.
Cleveland, model A, 1½", 2" and 4½".
Cleveland, Model C—1½" Motor Drive.
5-spindle Davenport, 9/16".
DRILLS, Radial—5', Bickford; 4' Mueller; 5' & 6' Western, Motor Drive; High Speed; B. B., 1 to 6-spindle.
GRINDERS; B. & S. No. 10, 11 & 14 Plain, S. C.
Heald Nos. 55, 60, 65, 70, and 75.
No. 2 B & S & No. 2 Diamond Surface.
10x30" Webster-Perks Universal.
Norton Plain, 6"x22", 10"x24, 36", 50" & 72".
Norton Crankshaft, 18"x62".
Landis Crankshaft, 16x48" S. C.
Landis 10"x36" Hyd. Type B, 30" wheel.
LATHES, American 16"x6', GH, QC, TA, MD.
Chard 18"x9" Tapping Attachment.
Springfield Ideal 15"x8' T. A., M. D.
Niles, B. & P., 36"x10', Triple Geared, M. D.
MILLS, No. 1-B Milwaukee Plain,
No. 2 Van Norman Duplex, M. D.
No. 3 Brown & Sharpe Plain.
Ingersoll 36"x8' Open Side, Adj. Rail, M. D.
Hall Planetary Thread Mill, M. D.
Presses: No. 56 Toledo Trimming, Side Shear.
No. 3-A Bliss & 41 & 44 Toledo Horning.
No. 34-P Toledo & P-3 Ferracute Solid Bk.
No. 29 Bliss Arch. bed 21½x 28".
SHAPERS, 24" G & E. Motor & Reeves Drive.
16" Queen City and 24" Cincinnati, Cone.

OTT MACHINERY SALES, Inc., 548 Second Ave., DETROIT, MICHIGAN

REASONABLY PRICED TOOLS

D-31 FOX MULTIPLE DRILL, RECT. HEAD, 16'x31½' spindle centers. Bored for 36 spindles. Has ten 1¼ No. 2 Taper spindles. Power feed to head.

AUTOMATICS, Several Model A Clevelands, from ⅝' to 3¾' bar capacity.

BOLT CUTTER, 1¼' Acme single, class A; 2' Landis.

DRILLS, 36' Cincinnati back geared, sliding head, tapping attachment. No. 12 Minster H. D.; 24' Barnes All Geared Self Oiling belt drive.

GRINDERS, 14'x72' Norton Plain; 12'x72' Landis M. D.; No. 78 W· & M. Surf. M; D.

LATHES, 38'x14' Fifield—Cheap; 16'x8' Sidney, double back geared, quick change; 14x6 Carroll Jamison; 18'x8' Lodge & Shipley, Geared Head.

MILLERS, No. 2B Brown & Sharpe plain, single pulley drive; No. 6 Becker Vertical with ball bearing countershaft; 8' P & W Automatic; No. 3H LeBlond heavy duty plain.

PLANERS, 30'x30x8' Cincinnati, two heads on rail; 36'x15' Betts, 2 heads.

PRESSES, O. B. I.—No. 3 and 4 Walsh; No. 2½ Robinson.

RADIAL DRILL, 3' Prentice, gear box drive; 3' Cincinnati Bickford cone drive.

SCREW MACHINES, No. 4 Warner & Swasey univ. cone head, also plain screw machine, 3—No. 1 Brown & Sharpe wire feed; No. 4 Milholland; No. 4 Foster cone head. 1½'x9'; Acme cone head; No. 5 Foster grd. head—No. 4 Warner & Swasey grd. hd.

SHAPER, 28' Kelly B. G. Single pulley drive, 10 H. P. A. C. Motor.

Many other tools—exceptional "buys"—write for full details.

A. D. White Mchy. Co., 108 N. Jefferson St., Chicago, Ill.

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1, 2 & 3 spdle. Lel. G., Hi-sp. b.b., m.d.
1, 2, 3 & 4 spdl. Avey, Hi-sp., b.b., m.d.
1, 2 & 4 spdle. Colburn, No. 2 prod.
4 spdle. Cinc. Bick., dir. m. dr. in hd.
4 spdle. Leland G. & Allen, 12" overhang.
No. 1 P. & W. 2 spdle. horiz., deep hole, m.d.
6 spdle. P. & W. Deep Hole, vert., indiv. m.d.
Fox, Natco & Bausch Mult. Spdle., m.d.&m. (8).
No. 121, 217, 310 & 314 Baker (8).
21" & 24" Cin. B. (16), dir. m.d. & m., m. inhd..
3' Am. Sens. Hi Speed Radial, mtr. on arm.
3½' Morris Radial, single pulley drive.
Moline Hole Hog, various sizes (5).

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No. 16 Hi-sp. Gould & E. Gr. Hobber, spd.
No. 18H Gould & Eberhardt Hobber.
No. 36 S.T. G. & E. Auto., 4 spdle. Gr. Rough., m.d.

Grinders

Nos. 1, 2 & 3 Brown & Sharpe Universal.
No. 4 Brown & Sharpe Universal.
53" Besley vertical disc, m.d. & m.
Nos. 6, 12A & 20 Bryant Int. Chuck. (12).
No. 2B Brown & Sharpe Heavy, s.p.d.
48" Cincinnati Duplex.
48" Cincinnati Hydromatic.
18" Cinc. Semi-Auto., single & duplex heads.
Hall Planetary Thread, Style D, m.d. & m.

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24"x24"x6' Gray Double Housing, b.m.d.
36"x36"x14' Lib. Dble. Hsg., 3 hds., b. tb., m.d.
42"x42"x12' Liberty Openside, m.d. & m.
60"x60"x12' Niles Bement Pond, box table.

Presses

100 ton Oilgear Hydraulic vertical.
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No. 5AN Bliss, adj. bed, bk. gd., m.d. (5).
No. 14 Toledo Horning, geared motor drive.
No. 4A Bliss Adj. bed horning.
No. 204A Bliss Adj. Bed Horn., bk, gd., m.d.
No. 44 Cleveland, Adj. bed horning.
P-2, P-3, P-4 Ferra., solid back, g.m.d., (12).
DG-53 Ferr., S.S., S.C., B.G. G.M.D. (2).

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No. 3 Williams m.d. & m., 6" cap.
No. 31B-A Oster, 6" cap.

SPECIALS

No. 12 P & H Boring Mill, floor type, 7" dia. quill, m.d., 5¾" dia. spindle nose. Model "ID" Cleveland Single End Punch, m.d., cap. 2 holes, 1 through 1⅛" 36" throat.

Nos. 12 & 14 B. & S. Plain Cylindrical (7).
12" and 16"x36" Cincinnati Pl. Cyl. (2).
No. 3 Abrasive Surf., m.d. with motor in base.
Heald Internal Nos. 60, 70, 72, 75, (8).
No. 11 Gid. & L. Tero., hyd., inter., m.d.&m.(4).
No. 12 Gid. & L. Teromatic, hydr., int., md. & m. (7).

Lathes

No. 1A W. & S. Grd. Hd., m.d. with air chuck.
16"x6' Hendey Geared Head, t.a.
16"x8' Hendey, b.m.d. & m., t.a.
18"x8' American Grd. Hd., m.d.
24" x 12' Am. Grd. Hd. 28" x 8'6", 31" x 10' Wickes c/s., eccentric heads, all m.d.&m.
24" x 10' Lodge & S. Crankshaft, m.d.&m.
34" x 11' Wickes Crankshaft, m.d.&m. (2).
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Potter & J. Auto. Unimatic, m.d.&m. (2).
18"x8' Hendey, t.a., Drawbar & collets.

Mills

Pratt & Whitney Thread, 8x18".
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Thompson Horiz. Butt. 35 K.W.
20-27 KVA Taylor-Winfield Spot (9).
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100 KW Thompsor Projection Spot.
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Miscellaneous

1¼" Cone Auto., 4 spdle., m.d.
2 sp., ¾" cap. Land. Boltcut, ld. scr. att.
2 sp. 2" cap. Landis Bolt Cut., ld. screw att.
18" Gisholt Static Bal., vert. type, m.d. & m.
2 sp. Coulter Dia. Borer, motor in base.
Oilgear Twin Ten Hydraulic Broach.
No. 23 Williams & White Bulldozer, m.d.
Elwell-P. Lift Trucks, 3 t. & 6 t., Hi-Lift (2).
Wicaco Oil Groover, vertical type.
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Berwick Rivet Heaters, 220 & 440 volts (4).
Yoder Rolls 5 & 6 spin., 2-2½" dia. shaft.
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No. 6 H.S. Langelier Swager.
National Bent Shank Tappers, ½" capacity.
20" Sellers Slotter, b.m.d, Reeves Trans.

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No. 4 Kempsmith Maximiller Plain Milling Machine, Power Rapid Traverse, S. P. D.

Grinder, No. 20 Heald rot. sur., 9" ch., m. d.
Grinder, 12" Arter, rotary surf., m. d.
Grinder, surf. 12x36 Diam. auto., hyd. fd., m.d.
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Lathe, 14x8 Hendey, collets, pan bed, ser. 25400
Lathe, 20x12 Cisco grd. hd., m. d. tap. att.
Lathe, eng., 30"x18' Hou-Stanw-Gamble hvy.d.
Mill & shap. Mach. No. 14 Coch-Bly duplex.
Milling machine, No. 2½ Rockford plain.
Presses, Nos. 2, 3, 4 & 5 Bliss-Consol, o.b.i. pl.
Presses, Nos. 5, 6, & 7 o. b. i., Bliss Cons., b. g.
Shaper, Hendey 20" "V" ram, m. d.
Shaper, Kelly 16", back geared.
Shear, 10', 14 ga., 6', 14ga. D&K pwr, md prac new
Turret lathes, 2A & 3A W. & S. universal.

Inland Machinery Company
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16" Steptoe Shaper, Cone.
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Clev Mod A, ⅜"; Mod B, 1½".
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Gridleys Mod. F. 2¼". (3).
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Cincinnati Univ. Tool & Cut.
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W & M dbl. end drill grinder.
Heald Internal No. 55.

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2½" bar N.B.P., knee, M.D.
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7'-10' Ext. Type.
72" Bond, AC MD.
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7' American Univ. Gear Box.
6' Amer. Univ. & Plain.
6' Mueller, Gear box, M.D.
6' Cinc. Bick. Gear Box Dr.
5'; 4'; 3' Cinc. Bick., G. B.
3' American, Sensitive.
2, 4 & 6 Spindle Allens.
4 Spindle No. 2B Edlund.
4 Spindle Kokomo, No. 3 M.T.

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8"x54" Fitchburg Pl., m.d.
10"x36" Landis Plain (3).
12"x32" No. 2 Landis Univ.
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15"x15"x10' Norton Planer Type Surface.
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14"x72" Norton Self Cont.
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18" Badger No. 220 Disc.
24" Gardner No. 4 Disc M.D.
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14" P & W Surface M. D.
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LATHES

14"x6' Cisco t.s., draw-in.
14"x6' Monarch, q.c.g., cone.
16"x8' Greaves K., Q.C.G.

LATHES (Continued)

16"x8' Hendey Cone, T.A.
16"x8' Prentice, Grd. Hd.
16/18"x8' Am., Q.C.G., Cone.
18"x8' Advance, Q.C.G.
20"x8' Lodge & S. Cone.
19"x8' LeBlond, Cone.
20"x10' Greaves Klusman.
22/24"x8' Lodge & S., cone.
24"x12' Putnam Q.C.G., cone.
24"x19' American L. C. G.
28"x12' Boye & Emmes.
28"x17' Chard, Grd. Hd.
30"x18' Bridgeford turning.
32"x14' Boye & Emmes, Cone.
32"x16' Davis, M.D.
32"x17' Fifield, triple grd.
32"x22' Schumacher Boye.
36"x22' Pond Grd. Hd. m.d.
42"x18' Pittsburgh QCG Cone.
42"x20' L. & S. Cone, Q.C.G.
48"x40' Fifield, Cone.
60"x25' Gleason hvy. duty.

MILLERS

1B & 1½B B. &S. G.H.,S.P.D.
No. 2 Cincinnati Pl., Cone.
No. 3 Cinci., Rect. Overarm, Motor in Base.
No. 4 Cin. Hi Power Pl. P.R.T.
No. 4G LeBlond S.P.D.
No. 2M Cin. Vert., Mtr. in B.
Nos. 5, 5C, 6 & B Beck. Vert.
Model C8 Becker Continuous.
No. 2 Cin., Univ. Grd. H. M.D.
No. 2 B & S Univ., Cone.
No. 3 LeBlond Univ., Cone.
4" P & W Spline (3).

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84"x84"x18' N.BP., M.D. (4)
48"x60"x12' Gray, 2 Hds.
48"x36"x10' Gray, 2 Hds.
36"x36"x8' D. & H. Openside
30"x30"x9' Powell, 2 Hds.
24"x30"x6' Cinci., 2 Hds.
36" Newton Rotary, M.D.
30"x30"x10' D. & H. Openside.
24"x8' Gray; 24"x7' Niles.
24" Lynd Farquhar Openside.

TURRET LATHES

1⅝" & 2" P. & W's. (2).
3¼"x36" Cinci. Acme, Grd. Hd.
No. 4 W. & S. cone, screw.

TURRET LATHES (Continued)

No. 5 Foster, 1-13/16" bar.
24" Gish., 6¼"H.S., A.C., M.D.
24" Steinle, 6¼" H.S., M.D.
2¼"x24" & 3"x36" J. & L.

MISCELLANEOUS

Automatic, 2¼" Gridley, 1 Sp.
Billet Breaking Mach., Ajax.
Bolt Threader, 1¼" Landis.
Broach, No. 3B LaPte. M/D.
Chucking, Nos. 34 & 23 N. B.
Flanger, ¼" McCabe Pneu.
Gear Cutter, 110" Newton Spur
Gear Planer, 24" Gleason.
Gear Hob., No. 12 Barber Cole.
Gear Hobber, 6" Pfauter.
Gear Shaper, No. 61 Fellows.
Gear Generator, 11" Gleason.
Header, 2" Acme, Steel.
Keystra., No. 1 Bak., No. 1 Dav.
Keyseat., Nos. 2, 3 & 4 M&M
Pipe Machine, 8" Williams.
Pipe Machine, 12" Saunders.
Pipe Mach., 2" Bignall Keeler.
Press, 400 ton N.B.P. H. Hy.
Press, No.8½ Z & H Percussion
Press, No. 61 Spec. V & O.
Press, No. 74 Bliss Consolidat.
Punch & Shear No. 47 PBC B.
Punch 54" H & J No. 2 D.E.
Punch, 36" Whit. ¾"x¼".
Rolls, 10'x½" Niles.
Rolls, 14'x1" Wickes
Rolls, 20'x⅝" H & J No. 6
Rolls, Straight, 7'x1" N.B.P.
Rolls, 6"x6"x¼" Angle.
Rolls 10'x½" Rock River, Belt.
Saw, 9"x9" Peer. Univ., M/D.
Saw, 9"x9" Peer. Hack, M/D.
Saw, No. 17 Higley 8" Cold.
Saw, No. 2 Cochrane Bly 6" C.
Saw, 6" Avey Millband.
Saw, 6" Gorton No. 2B Inter.
Saw, 12"x15" Racine M/D.
Shear, 156"x¼" United, 36" g. 126"x¼" Amer., 22" Gap. 126"x¼" Niagara, 18" gap.
Shapers, 24", 20" & 16" Cinci.
Shaper, 16" American, Cone.
Shaper, 24" Gould & Eberhardt
Shaper, 16" Ohio, M/D.
Shaving Mach. P. & W. Vert.
Shear, Angle, 8"x8"x1" H.&J.
Shear, 30" Cleveland, No. X.
Slotter 15"-18" Dill.
Slotter, 24" Newton, M/D

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3' American Sens. Radial Drill, Motor on the arm, enclosed hd., tap. att., 99% new.
No. 20 Van Norman Duplex Miller, S.P.D., comp. rebuilt.
No. 3-S Cincinnati High Power Universal Mill, rapid traverse, comp. rebuilt.
No. 2 B. & S. Univ. Mill, Cone drive.
No. 13 B. & S. Univ. & Tool Grinder.
18"x8' American Lathe, Q. C. G., 3 step cone, D. B. G., bowl head.
20"x10' LeBlond Lathe, Q. C. G., 3 step cone, D. B. G. raising blocks to 30".
22" Cincinnati Upright Drill, motor drive, Q. C. G. box, tapping attachment.

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Automatic Screw Machines

Model No. 263 New Britain.
Model No. 454 New Britain.
Model No. 562 New Britain.
Model No. 652 New Britain.
1¾" Gridley Model "G" 4 Spindle, Arr. M. D.
2¼" Gridley Model "F" 4 Spindle, Arr. M. D.

Turret Lathes

No. 3-A Warner & Swasey, rebuilt, late serial.
No. 2-A Warner & Swasey, equipped.

Grinder

No. 72-A-3 Heald Gagematic Hydraulic Internal, Motor Drive.

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20" Barnes Camel Back, Self Oiling, Single Spindle, (3).
24" Barnes Camel Back, Self Oiling, Single Spindle, (2).

BARR MACHINERY COMPANY, 813 W. Lake St., Chicago, Ill.

RADIAL DRILL, 4' arm; Pl., Cin.-B, 11" column; Motor Dr.; 3' and 2½' Fosdick; 6' NBP full Universal.
AUTOMATICS: Brown & Sharpe No. 2-G, Motor Dr., Nos. 0, 00; 1¾" Gridley, Model F, complete. Acme ⅞".
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INTERNAL GRINDER, No. 70 Heald, Clutch Head.
PLAIN GRINDER, Norton, 14"x54".
TURRET LATHES, No. 2A W. & S.; 21" Gisholt, M. D.
PRESSES, Toggle, Bliss No. 1, with Littell Reel; Stoll No. 98 Toggle draw and lift out 5"; V. & O. No. 5 Grd., Nos. 1 & 2½ O.B.I. Bliss No. 306, Grd. S. S., Tie-rod, 6' Str.
DIAMOND BORING MACHINE, Colburn, Horiz. Hydraulic Feed, Motor Drive.
AIR COMPRESSORS: Bury 500', 2-stage.
KEYSEATER, Baker No. 3, 72" capacity.
MOTORS—all sizes. Large stock.

Partial List—Every Item Guaranteed.

FALK MACHINERY COMPANY
18 Ward Street, Rochester, New York

NEW 3 Phase B. B. Motors ½ to 25 H. P., 5 H. P. $55.75

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20" Lever, Wheel & Lever and Power Feed.
24" and 28" sliding head, back gear, power feed.
Bausch Multiple 16 spindle No. 1 Morse Taper.
4 spindle Foote-Burt, heavy duty.
6 spindle Hole Hog No. 1 Morse Taper, power fd.
1, 2 and 4 spindle high speed 8" overhang.
3' Silver Radial, almost new.
59 other drills of various sizes and types.

MISCELLANEOUS

Boring Mill, No. 5A Defiance horizontal.
Brakes, 6' and 10' for 18 gauge.
Grinders, cutter and cylindrical, plain and univ.
Grinders, Bryant deep hole chucking.
Broaching machine, No. 1 LaPointe.
Lathes, 25"x12' Sidney, quick change gear.
31 other lathes 10" to 24" swing, 5' to 14' beds.
Milling Machines, Nos. 1½, 3 and 4 plain.
Milling Machine, 20"x20"x8" Ingersoll Slab, m. d.
Milling Machine, No. 1 Bilton, automatic gear.
National Acme Automatics Nos. 52, 53 and 55.
Shapers, 16", 18", 20" and 24" b. g. crank.
Turret Lathes, 21" and 24" Gisholt, m. d.
Planer, 36"x36"x12' Gray extra hvy. pattern 4 hds.
Press, No. 24 Toledo double acting cam drawing.
MOTORS, REBUILT 3 Phase ½ to 50 HP various speeds.

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THE OSBORNE & SEXTON MCHY. CO., Dept. H. COLUMBUS, OHIO

HILL-CLARKE QUALITY

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No. 1 Cleveland, 2½" bar.
No. 21 Lucas, 2½" bar.
No. 3-A Universal, 3" bar.
No. 2 Rochester, 3" bar.
No. 3½ Universal, 3½" bar.
No. 2 Lucas, 3¾" bar, gear box drive.
5" Bar Niles-Bement-Pond, Fl. Type.

BORING MILLS

24", 36" Bullard "New Era".
30", 36" King.
42" Gisholt.
48", 54", 60" Colburn.
52", 72" King.
72" King, motor drive.
77" Niles, Bement, Pond.
10' Niles.

DRILLS

No. 2 Colburn, 3, 4 Spindle.
No. 12 Colburn, 1 Spindle.
No. 314, 416 Baker Heavy Duty.
No. D-4 Colburn Heavy Duty.
No. 14 Natco Multiple.
No. 1, No. 3, No. 4 Baush Multiple.
3' American Plain Radial.
3' Western Plain Radial.
4' Western, heavy radial.
5' American Full Universal Radial.
6' Western Plain Radial.
6' American triple purpose Radial.
7' Western heavy Radial.

GRINDERS

8"x18", 36" Cinn., Plain, Saddle Type.
20"x168" Landis Pl., Motor Drive.
26"x96" Landis.
No. 2 Brown & Sharpe Universal.
No. 70 Heald Internal.
No. 22-12" Heald rotary surface.
No. 16-26" Blanchard vert. surface.
No. 16-A Blanchard Auto. Vert. Surface.

LATHES

14"x6' Lodge & Shipley Sel. Grd. Hd.
16"x6', 8' Lodge & Shipley.
18"x8' L.&S. Grd. Hd., taper att.
20"x10' Lodge & Shipley Grd. Hd.
19"x8' Le Blond Hvy. Duty Grd. Hd. M.D.
19"—38"x10' Le Blond Sliding Bed Gap.
22"x12' L.&S. Grd. Hd. taper att.
24"x14', 16' Lodge & Shipley Grd. Hd.
24"x14', 16' American, Geared Head.
27"x12' American Geared Head.
27"x18' Sidney, taper attachment.
30"x11', 15' American, Geared Head.
36"x12' L. & S. Sel. Triple Grd. Hd.
36"x14', 20' Lodge & Shipley Sel. Grd. Hd.
42"x34" Putnam Grd. Hd., 2 carriages.
46"x30' Houston, Stanwood & Gamble, m.d

NORTON MOTOR DRIVEN GRINDERS

6"x32"	10"x72"	14"x96"
10"x18"	10"-15"gapx72'	16"x50"
10"x24"	10"x96"	16"x72"
10"-15"gapx24'	14"x36"	18"x96"
10"x36"	14"x50"	18"-24"gapx96"
10"x50"	14"x72"	20"x96"
23"x120"	20"x144"	

MILLERS

No. 1-B, No. 2-B, No. 3-B Milw. pl.
No. 3 Cincinnati, Plain.
No. 3-B, No. 4-B Hvy., Brown & Sharpe, Fl.
No. 4, No. 5 Cincinnati H.P. plain.
No. 4 Kempsmith Maximiller.
No. 2 Brown & Sharpe Universal.
No. 2-B, No. 3-B Milwaukee Universal.
No. 3 Cincinnati Universal.
No. 3-B Milwaukee Vertical.
No. 3 Cincinnati H.P. Vertical.
No. 5-B, No. 6, No. C-2 Becker Vertical.
6"x14", 6"x48" Pratt & Whitney Thread.
No. 4, No. 12 Lees-Bradner Thread.
No. 5—48" Cincinnati Hydromatic.
18" & 24" Cincinnati Auto. Duplex.

PLANERS

24"x24"x8' Cincinnati.
30"x30"x14' Gray, reversing motor dr.
36"x36"x8', 12', 18' Cincinnati.
36"x36"x12' Gray Maximum Service, M.D.
36"x36"x14'—24' Cleveland Open Side.
42"x42"x30' Niles-Bement-Pond, Rev. M.D.
48"x48"x10' Detrick & Harvey, Open Side.
48"x48"x16' Niles-Bement-Pond.
72"x60"x16' American Widened Pattern.
72"x72"x16' Cincinnati, M.D.

PRESSES

No. 01 V&O., O.B.I., M.D.
No. 1 V.&O., O.B.I., M.D.
No. 1½ V.&O., O.B.I., M.D.
No. 20 Bliss, O.B.I., M.D.
No. 3 V.&O., O.B.I., Geared, M.D.
No. CG—24 Ferracute O.B.I., Geared, M.D
No. 5 V.&O., O.B.I., Geared, M.D.

SHAPERS

20" Smith & Mills.
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20"x8' Amer., 12' spd. grd., hd., reg. eq.
19"x8' LeBlond, belt drive, reg. equip.
18"x14' Cinc., b. d., tap. att., chuck.
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MISCELLANEOUS

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1½" and 2" Landis Bolt Cutters
2" & 4" Landis Pipe Machines
6' Bickford full Univ. Radial Drill
18" Gould & E. Gr. Hob., cap. 30"x12"
"G" Rock River Punch 24" throat cap.
¾"x¾", motor drive

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Grinder, No. 33 ABRASIVE Vertical Spindle Surface.
Hammer, No. 5 BEAUDRY, Wt. of Ram 125 lbs.
Keyseater, No. 2 Mitts & Merrill.
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Planer, 36"x36"x16' CLEVELAND, Open Side, FACTORY REBUILT.
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25" Foadick Upright Drill, Sliding Head, M. D.
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Radial Drill	4' Mueller.	Pipe Machine	12" Curtis & Curtis, Mtr. Dr.
Grinder	No. 2 Cincinnati Universal.	Planer	24" Cincinnati Crank.
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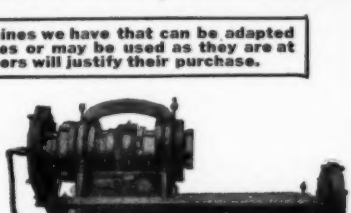

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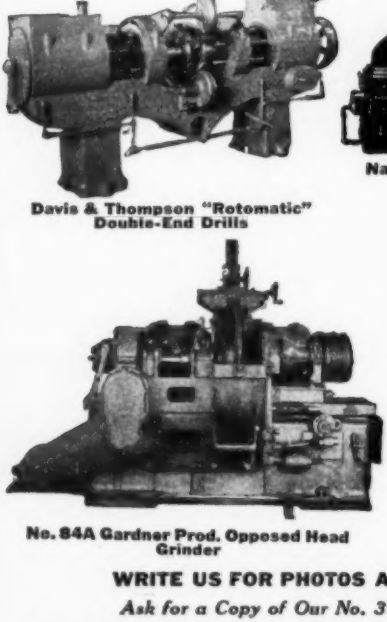

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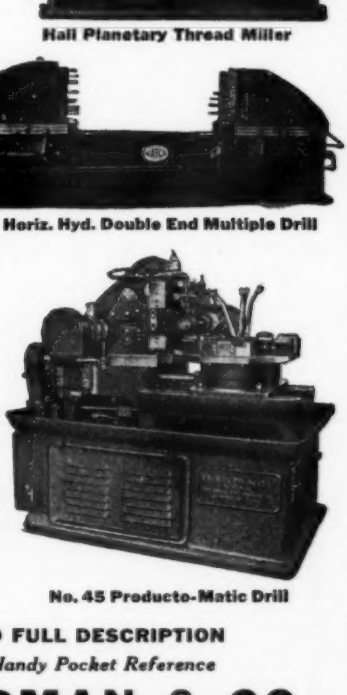

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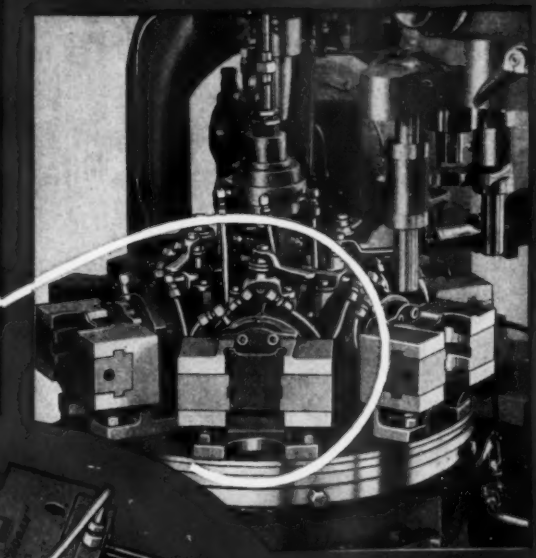

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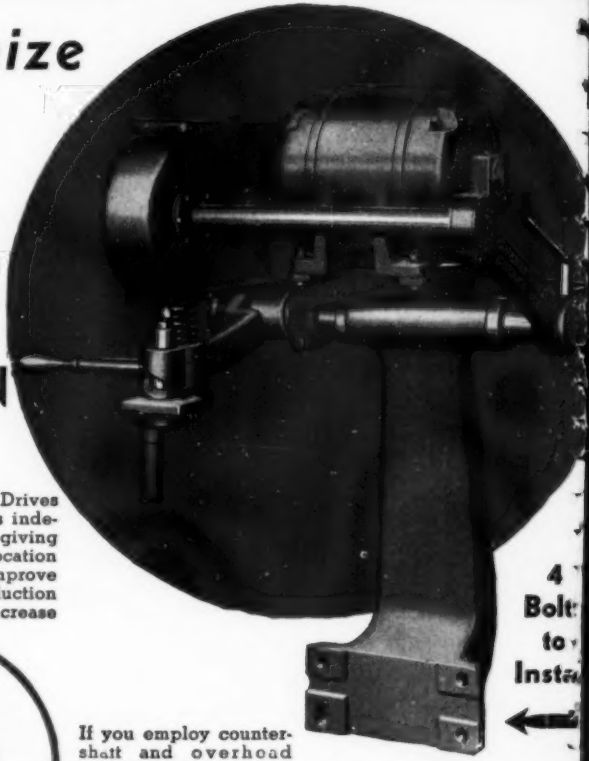

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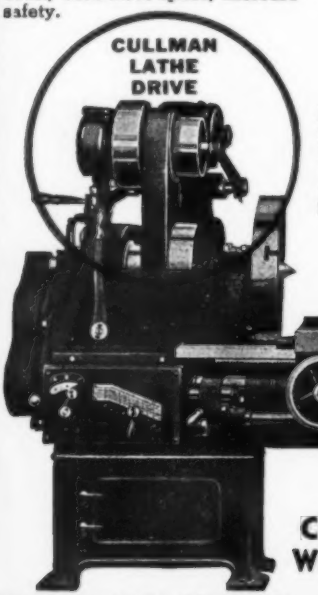

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